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Pinellas STAR Center

Quarterly Progress Report for July through September 2001

Sitewide Environmental Monitoring at the Pinellas STAR Center

November 2001

U.S. Department of Energy

GRAND JUNCTION OFFICE

Work Performed Under DOE Contract No. DE–AC13–96GJ87335 for the U.S. Department of Energy

Pinellas STAR Center

Quarterly Progress Report
for the
Pinellas STAR Center
Groundwater Cleanup Project

July through September 2001

November 2001

Prepared by
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Acronyms and Abbreviations

AST	air stripper tower
BTEX	benzene, toluene, ethylbenzene, and xylene
°C	degrees Celcius
CMS	Corrective Measures Study
CMIP	Corrective Measures Implementation Plan
ComQAP	Comprehensive Quality Assurance Plan
DCA	dichloroethane
DCE	dichloroethene
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
ft	feet
ft/ft	feet per foot
HSWA	Hazardous and Solid Waste Amendment
ICM	interim corrective measures
ICMS	Interim Corrective Measures Study
ITRD	Innovative Treatment Remediation Demonstration
IWNF	Industrial Wastewater Neutralization Facility
MACTEC–ERS	MACTEC Environmental Restoration Services, LLC
MCL	maximum contaminant level
MSL	mean sea level
µmhos/cm	micromhos per centimeter
µg/L	micrograms per liter
mg/L	milligrams per liter
mV	millivolt
NAPL	non-aqueous phase liquid
NTU	Nephelometric Turbidity Units
PCIC	Pinellas County Industrial Council
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RPD	relative percent difference
SDWA	Safe Drinking Water Act
STAR	Science, Technology, and Research
STL	Severn Trent Laboratories
SWMU	solid-waste management unit
TCE	trichloroethene
TVOC	total volatile organic compound
VOCs	volatile organic compounds
WWNA	Wastewater Neutralization Area

1.0 Introduction

The Pinellas Science, Technology, and Research (STAR) Center is a former U.S. Department of Energy (DOE) facility constructed in the mid-1950s in Pinellas County, Florida. The 99-acre STAR Center is located in Largo, Florida, and lies in the northeast quarter of Section 13, Township 30 South, Range 15 East (Figure 1). The STAR Center, while owned by DOE, primarily manufactured neutron generators for nuclear weapons. Other products manufactured at the STAR Center have included radioisotopically powered thermoelectric generators, thermal batteries, specialty capacitors, crystal resonators, neutron detectors, lightning-arrestor connectors, and vacuum-switch tubes. In 1987, the U.S. Environmental Protection Agency (EPA) performed a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) at the site to gather information on potential releases of hazardous materials. In February of 1990, EPA issued a Hazardous and Solid Waste Amendment (HSWA) permit to DOE, enabling DOE to investigate and perform remediation activities in those areas contaminated by hazardous materials resulting from DOE operations. In November 2000, the State of Florida received HSWA authorization from the EPA. On March 17, 1995, DOE sold the facility to the Pinellas County Industrial Council (PCIC). The sales contract included clauses to ensure continued compliance with Federal, State, and local regulations while DOE remediates the site. On July 1, 1999, the PCIC was disestablished and ownership of the STAR Center changed to the Pinellas County government.

Administration of DOE activities at the facility is the responsibility of the DOE Idaho Operations Office. Responsibility for environmental restoration activities, conducted under the EPA RCRA Corrective Action Program of 1984, was transferred from DOE's Pinellas Area Office to DOE's Grand Junction Office in October 1997. MACTEC Environmental Restoration Services, LLC (MACTEC–ERS), a prime contractor to the DOE Grand Junction Office, provides technical support to DOE for remediation and closure of all active solid-waste management units (SWMUs) on site.

Groundwater monitoring and remediation are also ongoing at the 4.5 Acre Site. The 4.5 Acre Site is a parcel of land that was originally part of the DOE facility but was sold to a private individual. In 1984, groundwater contamination was discovered at this site. Currently, DOE leases the site from the land owner and is actively pursuing groundwater cleanup. The 4.5 Acre Site is under purview of Florida State regulations enforced by the Florida Department of Environmental Protection (FDEP). A summary of remediation activities can be found in the *Interim Remedial Action Quarterly Progress Report for the 4.5 Acre Site.*

The EPA RFA Report and the HSWA permit identified 15 sites at the former DOE facility that may have experienced environmental contamination as a result of past activities. Upon completion of the RCRA Facility Investigation, 11 of the 15 SWMUs were recommended by DOE and approved by EPA Region IV and the FDEP for no further action (DOE 1994). A twelfth site, the Former Pistol Range Site, was remediated in 1993 and recommended by DOE and approved by EPA Region IV and the FDEP for no further action.

Two additional SWMUs, the West Fenceline Site and the Wastewater Neutralization Area/ Building 200 (WWNA/Building 200), were identified after the HSWA permit was issued, bringing the total to 17 SWMUs that have been identified and investigated at the STAR Center. Remediation of the West Fenceline site was completed in 1997 and DOE recommended, and EPA Region IV and FDEP approved, no further action. A Corrective Measures Study

(CMS)/Corrective Measures Implementation Plan (CMIP) was prepared and submitted in 1997 to EPA Region IV and FDEP to address the contamination at the WWNA/Building 200 Area.

Therefore, there are currently four sites that have contamination in the surficial aquifer groundwater at levels in excess of protective standards. These four SWMUs, the Old Drum Storage Site (PIN06), the Industrial Drain Leaks-Building 100 Area (PIN12), the Northeast Site (PIN15), and the WWNA/Building 200 Area (PIN18), have been recommended for or are undergoing remediation activities. Two SWMUs, PIN06 and PIN12, are currently being remediated together because of their similar groundwater contamination and proximity. These two SWMUs are collectively known as the Building 100 Area. Figure 2 depicts the location of the four SWMUs.

Additional background information relative to each SWMU is briefly described below. This document also serves as the quarterly progress report for each of these four SWMUs. The results of monitoring activities, a summary of the treatment system performance, and a summary of ongoing and projected work are provided in this report.

1.1 Building 100 Area

The Building 100 Area (PIN06 and PIN12) is located in the southeast portion of the STAR Center. The Old Drum Storage Site is the former location of a concrete storage pad equipped with a drain and containment system used to store hazardous waste including dichloromethane (also known as methylene chloride), ignitable liquids, arsenic, and calcium chromate solids (DOE 1987a). Empty drums containing residual waste solvents were also stored in this area (DOE 1987b). The concrete pad was located near the northwest corner of Building 100. The pad was removed in October 1983 in accordance with an FDEP closure permit (DOE 1987a), and a closure report was submitted to the FDEP in August 1986 (DOE 1986). The decommissioning of the pad and the cessation of drum storage effectively removed the potential for a future contaminant source at PIN06.

Building 100 is the largest building on site and covers approximately 11 acres. In the past, offices, laboratories, and production facilities for the DOE were housed in the building. SWMU PIN12 consists of the liquid waste drainage system serving Building 100. Four individual drainage systems (sanitary, chemical, health physics, and storm water) were present within the building. In 1989, all four drainage systems were investigated, including verifying the system routing and the condition of underground and above-ground piping and ancillary equipment (EMC 1989). As a result of this investigation, the health physics and chemical drainage systems were flushed, grouted, and abandoned (DOE 1997). Some of the chemical drain lines were replaced by an above-ground system currently used by tenants of the building.

A CMS and CMIP were completed and approved for the Building 100 Area because VOCs concentrations measured in groundwater at the Old Drum Storage Site (PIN06) and one monitoring well located at the northwest corner of Building 100 (PIN12) exceeded the Safe Drinking Water Act (SDWA) and FDEP maximum contaminant levels (MCLs). Subsequent investigations revealed elevated VOCs concentrations under Building 100 and downgradient to the southeast as well. On August 15, 2000, the EPA approved the Building 100 CMIP Addendum. The FDEP approved this same document on November 15, 1999.

Commencing in May 2001, DOE began an analysis of the potential remediation strategies for Building 100 including the need for a containment barrier to retard the potential of offsite migration of contaminants, source treatment and dissolved phase treatment. The *Building 100 Area Remediation Technology Screening Report* (DOE 2001) was prepared and assembled a list of remediation technologies, categorized them into the remediation tasks, and conducted an initial screening of the technologies. The final technology for each task will be identified at a later date. This initial screening simply eliminates the technologies that obviously will not work and recommends technologies that should be retained for detailed evaluation at a later time.

1.2 Northeast Site Area

In the late 1960s, before construction of the East Pond, drums of waste and construction debris were disposed of in the swampy area of the Northeast Site. The East Pond was excavated in 1968 as a borrow pit. In 1986, an expansion of the East Pond was initiated to create additional storm-water retention capacity. Excavation activities ceased when contamination was detected directly west of the East Pond. EPA identified the Northeast Site as a SWMU. An Interim Corrective Measures Study was developed and submitted to EPA and approval of this document was received in October 1991. An interim groundwater recovery system for the Northeast Site was installed, and operation commenced in January 1992. The implementation of this interim corrective measures (ICM) system at this site is consistent with the regulatory goals of the EPA's RCRA Corrective Actions (Subpart S).

The ICM system, as initially installed, consisted of four recovery wells equipped with pneumatic recovery pumps, a holding tank, centrifugal transfer pumps, and approximately 2,500 feet (ft) of transfer and secondary containment piping. During 1993, DOE proposed a reconfigured system for the site consisting of four shallow and three deep recovery wells. After EPA approved the system upgrade, the system was reconfigured and became operational on March 1, 1994.

Between August and October 1995, after EPA and FDEP approval, a portion of the Northeast Site was excavated to remove debris and other materials that could inhibit future corrective measures. Location of the areas of excavation was based primarily on the results of a geophysical survey and knowledge of existing utility locations. Detailed descriptions of the debris removal activities were submitted to EPA and FDEP as part of the *Northeast Site Interim Measures Quarterly Progress Report* (DOE 1996).

In 1996, DOE submitted a CMIP to EPA Region IV and FDEP. This plan was approved by both regulatory agencies in 1997. As part of the Northeast Site CMS and CMIP, a pump-and-treat system in conjunction with a subsurface hydrogeologic barrier wall to prevent migration of the contaminant plume was identified as the best available technology. A pretreatment system for iron removal, an air stripper unit, and a tank for holding treated groundwater before discharge to the Pinellas County Publicly Owned Treatment Works were recommended. The treatment system was constructed in early 1997 and became operational by July 1997 with seven Northeast Site recovery wells and two Building 100 recovery wells pumping to the system influent tank. Subsequently, several additional recovery wells were installed, and some of the old recovery wells were abandoned.

During 1997, anaerobic bioremediation and rotary steam stripping pilot tests were conducted in the northern and southern portions of the Northeast site, respectively. These tests were designed by an Innovative Treatment Remediation Demonstration group of regulatory and industry

members to provide remedial options at the STAR Center. At the conclusion of the field tests in July 1997, pump-and-treat technology resumed at the Northeast Site.

1.3 WWNA/Building 200 Area

The WWNA/Building 200 Area includes the active Industrial Wastewater Neutralization Facility (IWNF), the area around Building 200, and the area south of the neutralization facility. The IWNF refers to the physical treatment facility that currently receives sanitary and industrial wastewater and has been in operation since 1957.

A CMS Report and CMIP were completed in 1997 for this SWMU because vinyl chloride, trichloroethene (TCE), and arsenic were detected in surficial aquifer groundwater above Federal and State MCLs. The recommended remediation alternative for the WWNA/Building 200 Area was groundwater recovery with the Building 100 Area wells and an additional recovery well located in the WWNA. The CMIP recommended that recovered water from the additional well be discharged directly to the IWNF and that the recovery well in the WWNA/Building 200 Area will withdraw surficial aquifer groundwater directly from the arsenic plume and thereby reduce the contaminant mass and prevent contaminant migration.

The FDEP response to the CMS/CMIP concerning arsenic soil contamination in the upper 2 ft suggested that a treatment technology, air sparging, was eliminated too early. DOE then proposed a multi-phased Interim Action that included operating the recovery well for 6 months, then pulsing the system, as well as performing geochemical analyses and leaching studies of the site. On January 21, 1999, FDEP approved the proposed interim remedial action.

Additionally, EPA Region IV also approved the interim remedial action and concurred with the FDEP's position regarding the arsenic contamination. The EPA also requested an addendum or modification to the CMIP that addresses DOE's final selection of the remediation technology and a timeline for the completion of these activities.

In early June 1999, the WWNA recovery well commenced operation. All arsenic concentrations from the WWNA recovery well, PIN18–RW01, were below the STAR Center's daily maximum discharge standard for arsenic in wastewater of 0.20 milligrams per liter (mg/L) until shutdown.

Additional details concerning the impacts of groundwater extraction are reported in the WWNA/Building 200 Area CMIP Addendum (DOE 2000e). Modifications to the recovery of groundwater were proposed based on data collected through November 1999 and consisted of the installation of two new recovery wells screened at shallow intervals. The CMIP Addendum was submitted to the regulators and approved by FDEP and EPA. A Statement of Basis (DOE 2000d) was issued by DOE in late September 2000. This document provides a summary of environmental investigations and proposed cleanup alternatives for the WWNA/Building 200 Area. Current activities at the WWNA include groundwater extraction from two recovery wells, PIN18–RW02 and –RW03, and discharge to the STAR Center's wastewater system. Table 1 depicts the results of the analysis of arsenic in groundwater that is being recovered from these two wells.

1.4 Site Update

A technical and cost evaluation of four vendor responses to the In-Situ Thermal Remediation of Non-Aqueous Phase Liquid (NAPL) at the Northeast Site Request for Proposal was conducted during the later part of February and most of March 2001. The responses covered a conceptual design, life cycle schedule, and costs to implement. A vendor was contracted on July 6, 2001. A Conceptual Design was provided on September 14, 2001. Project regulatory documents are being prepared that will include an Environmental Checklist, Environmental Assessment, and an Interim Measures Work Plan.

Also at the Northeast Site the direct push technology was utilized to collect 20 groundwater samples from 10 locations for the purpose of evaluating the extent of the contaminant plume on the southern side of the Northeast Site. At each of the 10 locations, a sample of groundwater was collected from a depth of 18 to 22 ft and another sample collected from 26 to 30 ft. All groundwater samples were analyzed for volatile organics. Results will be available in early October 2001.

At Building 100, three small diameter groundwater monitoring wells (PIN12–S67B,C,D) were installed inside along the east-central portion of the building, approximately 90 ft east of the well triplet PIN12–S59B,C,D. Monitoring well PIN12–S67B is screened from 10 to 20 ft, –S67C is screened from 20 to 30 ft, and –S67D is screened from 30 to 40 ft. These three new monitoring wells will be sampled during the next quarterly sampling event in October 2001.

At the WWNA, arsenic concentrations continue to be monitored in groundwater recovered from the two recovery wells. Table 1 provides a summary of the analytical results from the WWNA. In September 2001, the sampling frequency at the WWNA changed from biweekly to monthly.

1.5 Quarterly Site Activities

MACTEC–ERS personnel conducted the following tasks at the STAR Center to fulfill the requirements of the scope of work for quarterly sampling:

- Obtained water-level measurements from all monitoring wells, recovery wells, and ponds on July 9, 2001.

- Conducted the quarterly sampling event (i.e., collected 68 water samples from monitoring wells, recovery wells, and remediation system components) in July 2001 for analysis of volatile organic compounds (VOCs). Selected monitoring wells at the WWNA were sampled for the analysis of arsenic.

- Reported the results of quarterly sampling events (this document).

2.0 Water-Level Elevations

2.1 Work Conducted and Methods

Within an 8-hour period on July 9, 2001, depth-to-water measurements were taken at all accessible monitoring wells, test wells, and extraction wells at the STAR Center. The water levels were measured with an electronic water-level indicator. Groundwater and surface-water elevations are listed in Table 2, along with depths to water below the tops of the well casings and approximate depths to water below land surface.

2.2 Groundwater Flow

Groundwater and surface-water elevations were used to construct sitewide groundwater contour maps of the shallow and deep surficial aquifers (Plates 1 and 2, respectively). Individual contour maps were also constructed for the shallow and deep surficial aquifers at the Northeast Site, and the Building 100 Area (Figure 3 through Figure 6, respectively). All data points were honored when constructing the interpretive contours.

The water levels throughout the STAR Center indicate that the water table is highest in the area between the 4.5 Acre Site and the WWNA (Plates 1 and 2). As groundwater flows from this recharge area, it disperses in a radial pattern to the north, east, and southeast across the STAR Center. These flow patterns are similar for both the shallow and deep surficial aquifers.

At the Northeast Site, groundwater flow patterns, especially in the deep surficial aquifer, are greatly affected by withdrawals from ten active recovery wells. The cones of depression resulting from the pumping of these recovery wells are particularly evident on Figure 4. The overall influence of the recovery wells in the deep surficial aquifer extends to the periphery of the Northeast Site in all directions.

Along the northern boundary of the Northeast Site, the contours near the slurry wall indicate that the wall continues to be a significant barrier to groundwater flow. As seen on Figure 4, there is a differential of more than 3 ft between the downgradient and upgradient side of the wall as measured in monitoring wells PIN15–M24D and –M33D. This differential is similar to that observed last quarter. This differential at the slurry wall continues to suggest that only a minimal amount of groundwater recharge to the deep surficial aquifer is derived from the pond. Otherwise, the differential between these two wells would be smaller and the groundwater gradient would be steeper near the pond, indicating recharge to the groundwater system. The steepness of the water table immediately west of the East Pond, however, indicates that the pond is recharging the shallow surficial aquifer (Figure 3).

In the shallow surficial aquifer just south of the Northeast Site, the hydraulic gradient was approximately 0.008 feet per foot (ft/ft). Using Darcy's Law, along with approximations of 1 ft/day for hydraulic conductivity and 0.3 for effective porosity, groundwater in the southern part of the site is estimated to move about 9 ft/year toward the northwest (i.e., toward the on-site extraction wells) under conditions influenced by pumping.

In the south-central part of the STAR Center, surficial aquifer flow (shallow and deep) is influenced by groundwater withdrawals from two recovery wells (PIN12–RW01 and –RW02) in

the northwest corner of Building 100 (Figure 5 and Figure 6). In addition, shallow surficial aquifer flow is influenced by withdrawals from recovery well PIN18–RW03 at the WWNA. Shallow groundwater beneath Building 100 flows out laterally to the north, east, and south. Surficial groundwater at the WWNA flows to the southeast, except where affected by recovery well withdrawals. The hydraulic gradient beyond the influence of pumping at the Building 100 and WWNA Areas was approximately 0.007 ft/ft. Using the approximations mentioned above, groundwater flow velocity in these areas is estimated to be about 9 ft/year.

Water-level elevations in the three wells screened in the upper part of the Floridan aquifer are presented in Table 3. The relative elevations in these wells are consistent with the regional groundwater flow direction, towards the northeast and Tampa Bay, for the Floridan aquifer.

A downward vertical hydraulic differential of approximately 6.7 ft existed between the surficial aquifer wells and Floridan aquifer wells at the Northeast Site. Table 4 illustrates the vertical hydraulic differential. This differential is consistent with the historical range of 5 to 9 ft.

Surface-water elevations were recorded from the East, South, and Southwest Ponds at the site and are presented in Table 5. The ponds are hydraulically connected to the shallow surficial aquifer system. The surface-water elevations for the South and Southwest Ponds increased since last quarter's measurements; the water level in the East Pond went down. The South Pond elevation of 13.72 ft was below both the drain holes in the vertical concrete containment around the pond. The South and Southwest Pond elevations were essentially the same in each pond.

3.0 Groundwater Sampling and Analytical Results

3.1 Work Performed and Methods

During quarterly sampling in July 2001, groundwater samples were collected from 68 monitoring wells by MACTEC–ERS personnel. Fifty-eight samples were analyzed for VOCs using EPA Method 8021. Ten samples were analyzed for arsenic using EPA Method 6010. Laboratory reports for VOCs and arsenic analyses are provided in Appendix A.

During the period of July 1 to September 30, 2001, the remediation system influent and effluent at the Northeast Site, as well as selected recovery wells at the Northeast Site, were also sampled. Analytical results for remediation system VOCs, iron, and hardness (as $CaCO_3$) sampling are provided in Appendix B.

Beginning on February 26, 2001, samples were collected from PIN18–EFF1, –RW02 and –RW03 and analyzed for arsenic using EPA Method 6010. PIN18–EFF1 is the combined effluent from PIN18–RW02 and –RW03 upstream of the IWNF. PIN18–EFF2 is the effluent from the IWNF. This sampling will be ongoing until September 2001; the available data are summarized in Section 1.1 and presented in Appendix C.

All samples were collected in accordance with the MACTEC–ERS *Comprehensive Quality Assurance Plan* (ComQAP) (FDEP No. 970141–3), which is on file with the FDEP. All samples collected were submitted to Severn Trent Laboratories (STL), and analyzed under their FDEP-approved ComQAP (FDEP No. 890142G). The majority of monitoring wells were micropurged

using a dedicated bladder pump, and sampling was performed when the field measurements stabililized. The remaining wells were conventionally purged with a peristaltic pump or a 2-inch diameter stainless-steel submersible pump; purging was considered complete when five well volumes were purged and one set of field measurements was taken. Extraction wells were sampled using their associated flowlines with dedicated sampling ports. Table 6 lists field measurements of pH, specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, and temperature recorded at the time the sample was collected. Measurements were made with a flow cell and a multiparameter instrument.

3.2 Analytical Results

3.2.1 Northeast Site (PIN15)

Total VOCs (TVOCs), benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations in samples collected from wells at the Northeast Site (PIN15) are included in Table 7 and Table 8, respectively. Table 9 provides data on additional VOCs detected that are not included in Table 7 and Table 8. Figure 7 shows the TVOC concentrations and includes BTEX compounds.

No VOCs were detected in the 16 monitoring wells listed below:

PIN15–0503	PIN15–0530	PIN15–M18D	PIN15–M28S
PIN15–0515	PIN15–0534	PIN15–M26D	PIN15–M29S
PIN15–0516	PIN15–0559	PIN15–M27S	PIN15–M32D
PIN15–0520	PIN15–M12D	PIN15–M28D	PIN15–M32S

The 26 monitoring wells listed below contained detectable VOCs:

PIN15–0502	PIN15–DRW5	PIN15–M31D	PIN15–RW13
PIN15–0514	PIN15–M03D	PIN15–M31S	PIN15–RW14
PIN15–0535	PIN15–M16D	PIN15–M34D	PIN15–RW15
PIN15–0536	PIN15–M18S	PIN15–RW08	PIN15–RW16
PIN15–0537	PIN15–M26S	PIN15–RW09	PIN15–RW17
PIN15–0557	PIN15–M27D	PIN15–RW11	
PIN15–0558	PIN15–M29D	PIN15–RW12	

TVOCs concentrations ranged from 1.0 micrograms per liter (µg/L) in well PIN15–M18S to 125,900 µg/L in well PIN15–RW17. The compound detected at the highest concentration in PIN15–RW17 was cis-1,2-dichloroethene (DCE) at a concentration of 82,000 µg/L.

3.2.2 Building 100 Area (PIN12)

TVOCs concentrations in samples collected from wells sampled at the Building 100 Area (PIN12) are included in Table 7. No BTEX compounds were detected. Table 9 provides data on additional VOCs detected that are not included in Table 7. Figure 8 shows the TVOCs concentrations.

No VOCs were detected in the three monitoring wells listed below:

PIN12–0518
PIN12–0522
PIN12–0528

Samples from the eight monitoring wells listed below contained VOCs at detectable levels. They are:

PIN12–0513	PIN12–0525
PIN12–0514	PIN12–0526
PIN12–0520	PIN12–RW01
PIN12–0524	PIN12–RW02

Detected TVOCs concentrations ranged from 4 µg/L in well PIN12–0525 to 15,600 µg/L in well PIN12–RW01. The compound detected at the highest concentration in PIN12–RW01 was TCE at a concentration of 10,000 µg/L.

Floridan aquifer well PIN12–0528 was sampled this quarter. No compounds were detected above the reporting limit.

3.2.3 Wastewater Neutralization Area (PIN18)

Samples were collected from the two wells listed below for VOC analysis; no VOCs were detected.

PIN18–RW02
PIN18–RW03

Arsenic samples were collected from 10 wells. Arsenic concentrations are listed in Table 10 and shown in Figure 9. The highest concentration of arsenic detected was 0.42 mg/L in PIN18–0501.

3.2.4 Perimeter and Other Monitoring Wells (PIN21, PIN06, PIN09, and PIN10)

Concentrations of TVOCs compounds measured in three samples from perimeter monitoring wells are included in Table 7. No BTEX compounds were detected. Figure 8 shows the TVOCs concentrations for the PIN21 wells.

No VOCs were detected in the two monitoring wells listed below:

PIN21–0503
PIN21–0505

The sample from PIN21–0512 contained TVOCs at 4.6 µg/L. The compound detected at the highest concentration in PIN21–0512 was vinyl chloride at a concentration of 3.1 µg/L.

3.3 Quality Assurance/Quality Control

MACTEC–ERS checked the analytical results from STL for quality assurance/quality control (QA/QC). One arsenic duplicate sample and six VOCs duplicate samples and were collected. Results of VOCs and arsenic analyses for each valid duplicate sample are listed in Table A–1 (Appendix A). The duplicate sample results were compared and the relative percent differences (RPDs) between the results were calculated. One sample/duplicate pair from PIN15–DRW5 did not meet the guidance criterion that the RPD results should be within the range of ±30 percent when the concentration is greater than 5 times the detection limit. This sample failed the criterion for vinyl chloride. This is a failure rate of less than 0.5 percent. All other data passed QA/QC criteria at a Class A level, indicating that all data may be used for quantitative and qualitative purposes.

According to FDEP guidelines, duplicate samples should be collected at a frequency of one duplicate for every ten or fewer samples. There were 58 groundwater samples analyzed for VOCs and six duplicate VOC samples collected. There were ten groundwater samples analyzed for arsenic and one duplicate sample. The duplicate goal was met for this sampling event.

During the quarterly sampling event, six trip blanks were submitted for analysis. Five of the trip blanks showed estimated methylene chloride levels above the instrument detection limit but below the reporting limit. The highest estimated methylene chloride concentration was 2.2 µg/L.

4.0 Treatment System and Recovery Well Performance

4.1 Northeast Site and Building 100

The Northeast Site groundwater treatment system was operational from July 1 through September 30, 2001. During this quarter, all available recovery wells in the Northeast Site wellfield and at Building 100 were operational, with the exception of RW01 at Building 100, which experienced a pump failure and remained off for the month of September. Also during the month of September, modifications were performed on the Northeast Site Groundwater Treatment System. The modifications entailed removal of inactive tanks, equipment, and the associated support structure. The process flow and remaining tanks were also modified to minimize or eliminate shutdowns due to heavy rainfall.

Table 11 provides a summary of analytical results for samples collected at the Northeast Site Treatment System during this quarter. FeRemede® continues to be utilized to effectively control the deposition of iron and hardness salts. The application of sodium hypochlorite as a microbiocide was not necessary to prevent biological fouling of the air stripper tower (AST) during the past 3 months.

From July 1 through September 30, 2001, 2,262,233 gallons of groundwater were recovered from the Northeast Site and Building 100 recovery wells. The volume of recovered groundwater treated by the Northeast Site Treatment System since its startup in June 1997 through September 2001 is presented in Chart 1. Charts 2, 3, and 4 present the monthly volume of groundwater recovered during July through September 2001 from the Northeast Site recovery wells.

The treatment system and recovery wells experienced downtime on three occasions in July due to excessively heavy rainfall and once due to a compressed air outage. The treatment system and recovery wells operation was also interrupted three times in August; once for a planned maintenance shutdown, once for a compressed air outage, and once for excessively heavy rainfall. For the month of September, the system and wells experienced multiple shutdowns due to modifications to the treatment system, tropical storm Gabriel, and excessively heavy rainfall. The monthly groundwater recovery from July through September 2001 for the Building 100 recovery wells is presented in Charts 5, 6, and 7, respectively.

Total percent on-time for the Northeast Site AST is illustrated in Chart 8. On-time for the AST for this quarter was affected by the above-described minor outages. Historical Summary of Groundwater at the Northeast Site and Building 100 is shown in Appendix D as Table D–1.

Table 12 in this report presents the calculated mass of selected analytes recovered with the Northeast treatment system for each month of this reporting period. These monthly results are based on the measured system influent concentration and influent groundwater flow.

4.2 Wastewater Neutralization Area

The two new recovery wells (PIN18–RW02 and –RW03) at the WWNA became operational on February 26, 2001. These new recovery wells replace the previous recovery well, PIN18–RW01. Each new well produces approximately 2.5 gallons per minute continuously with an electrical submersible pump set at approximately 12 ft below land surface. The effluent groundwater from each well is combined into a common header pipe and discharged into the industrial wastewater receiving tank at the IWNF. During this quarter, 650,710 gallons of groundwater were recovered from the IWNF. Since start-up on February 26, both wells have operated continuously.

5.0 Current and Project Work

5.1 Summary

Work for July through September 2001 included sampling of groundwater monitoring wells and recovery wells for water quality, flow, and water levels. The treatment system and recovery wells were operated during the entire quarter, except for one short period of downtime described in Section 4.0.

5.2 Project Work Conducted

- The Northeast Site treatment system influent, clear well, and effluent were sampled during the quarter. Treatment system effluent samples were analyzed for VOCs and the effluent discharge volume was recorded to comply with the county wastewater permit. In the effluent samples, all volatile organic aromatic compound concentrations were under the Pinellas County regulatory limit of 50 µg/L.

- The Northeast Site treatment system modifications project was conducted in September. The purpose of the project was to dismantle and remove unused equipment from the treatment

system and minimize the bermed treatment pad area. The project is expected to be completed in early October.

- Maintenance performed during the quarter was limited to minor maintenance activities and replacement of the previously mentioned components in Section 4.0.

6.0 Conclusions

The following conclusions are based on annual sampling conducted in July 2001.

- No significant changes in the surficial groundwater flow direction or relative potentiometric levels were observed for the prevailing pumping and seasonal recharge conditions.

- The highest concentration of VOCs was detected at the Northeast Site well PIN15–RW17.

- The cone of depression at the Northeast Site includes the area of monitoring well PIN15–0558 and the southernmost portion of the contaminant plume.

- Concentrations of VOCs decreased in downgradient monitoring well PIN15–0558 and the operation of recovery well PIN15–RW16 appears to be controlling plume movement along the southern perimeter of the Northeast Site.

7.0 Tasks to Be Performed Next Quarter

The following tasks are expected to be conducted during the next quarterly period (October through December 2001):

- Quarterly sampling activities will occur in early October 2001.

- Weekly and monthly sampling and analysis of groundwater will continue in order to provide compliance and system operations data.

- Treatment system optimization will continue as new issues develop.

- Utilization of the dedicated bladder pumps for quarterly sampling using the FDEP-approved micropurging technique will continue.

8.0 References

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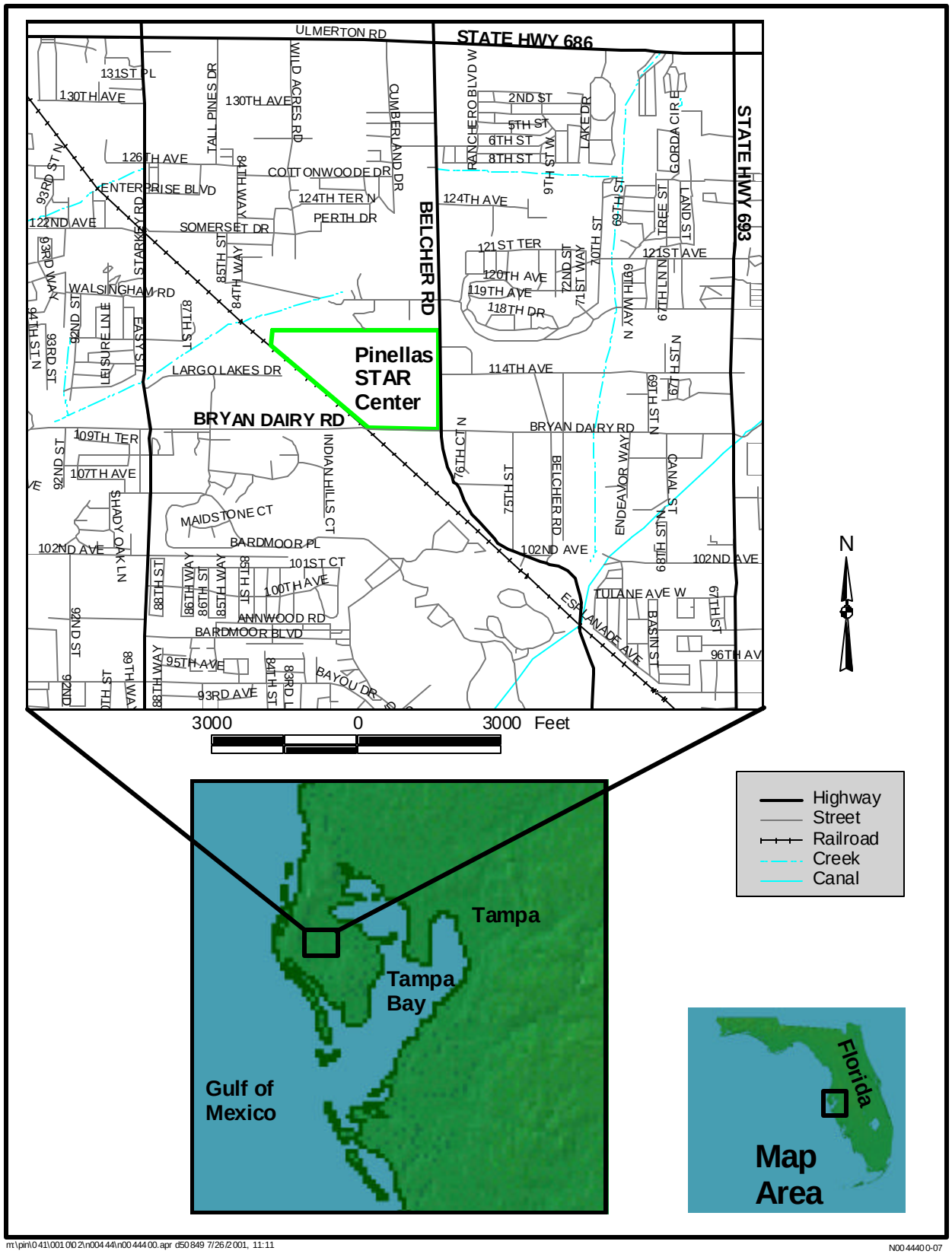

Figure 1. Pinellas STAR Center Location

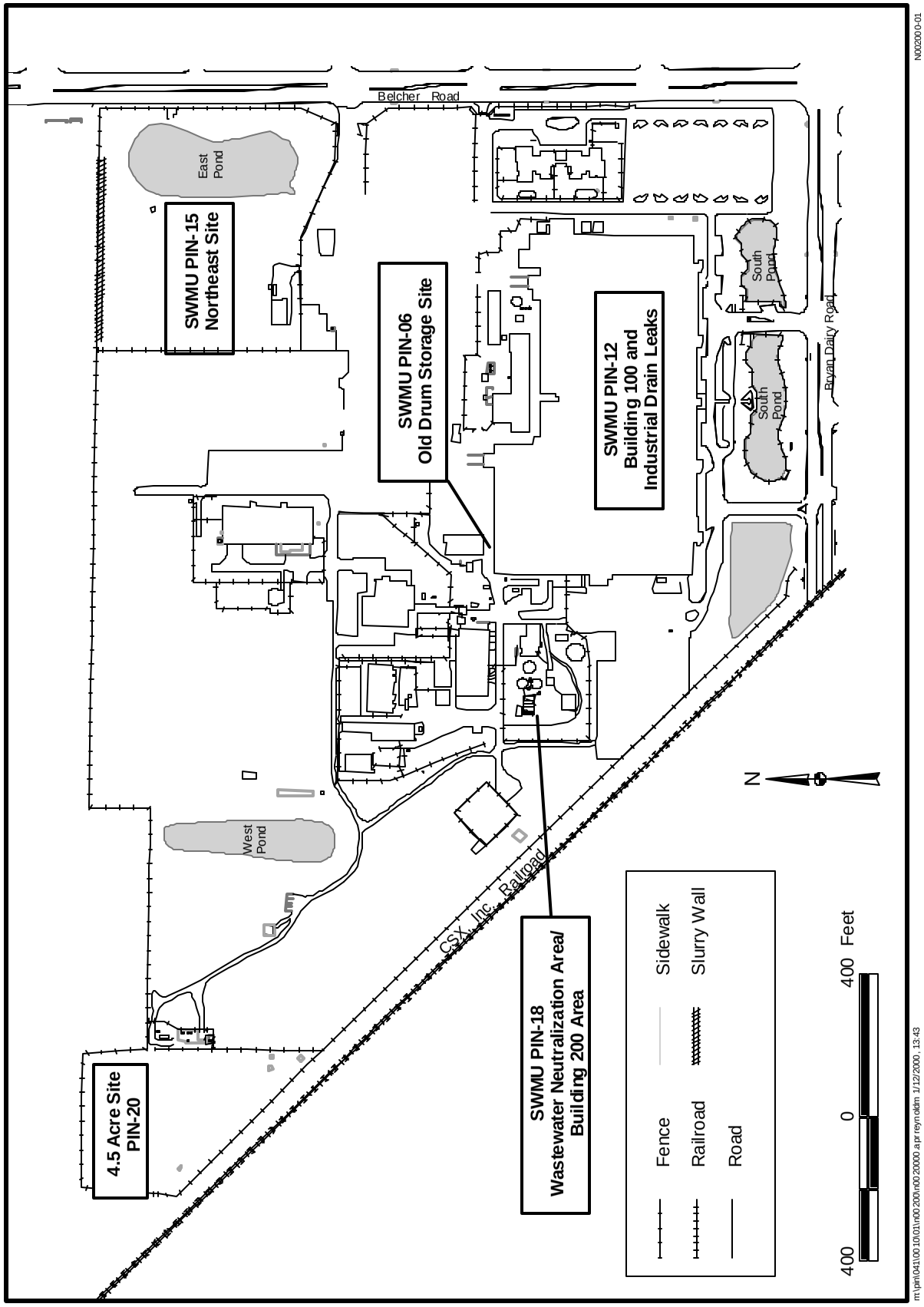

Figure 2. Location of Pinellas STAR Center Solid Waste Management Units (SWMUs)

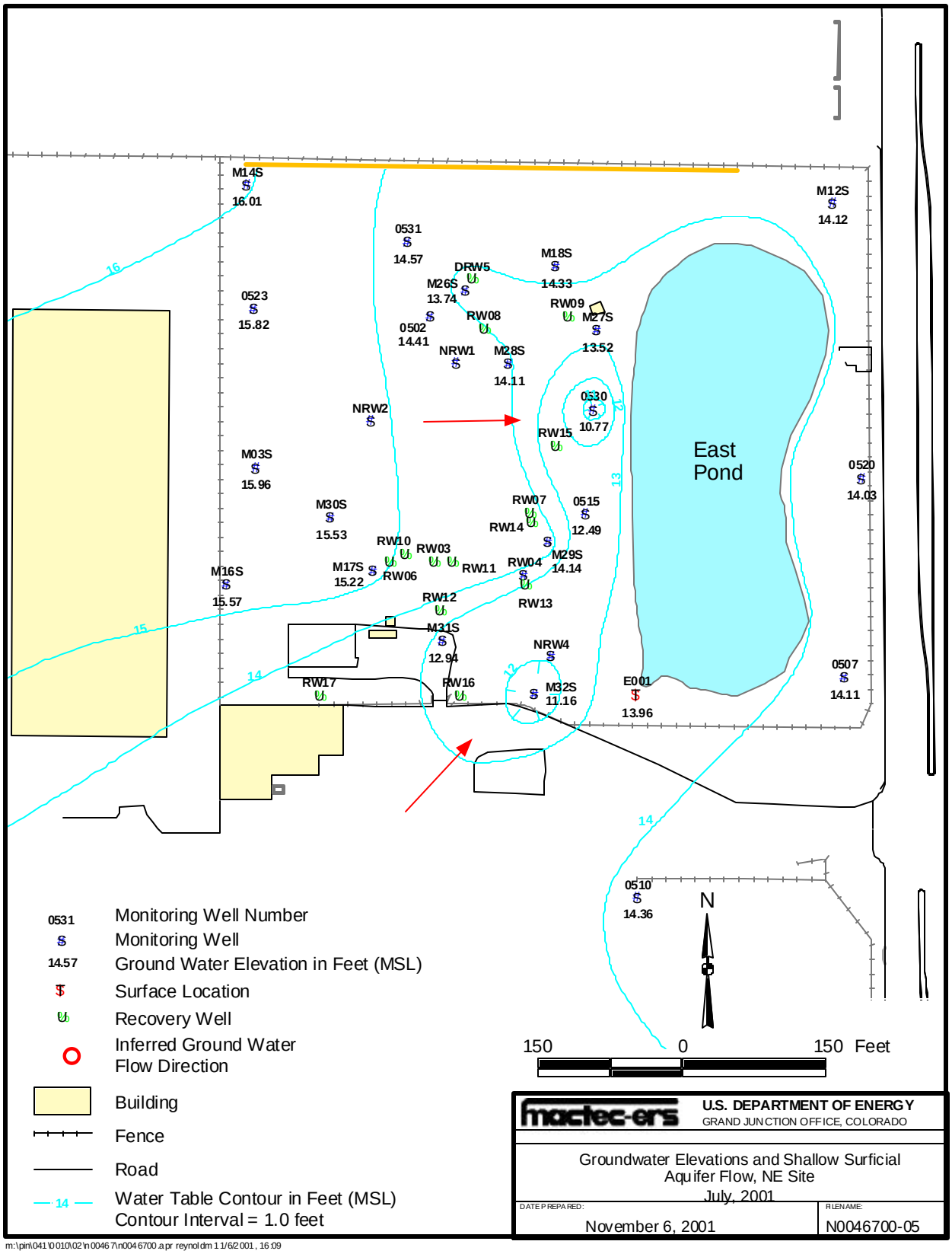

Figure 3. Groundwater Elevations and Shallow Surficial Aquifer Flow, Northeast Site, July 2001

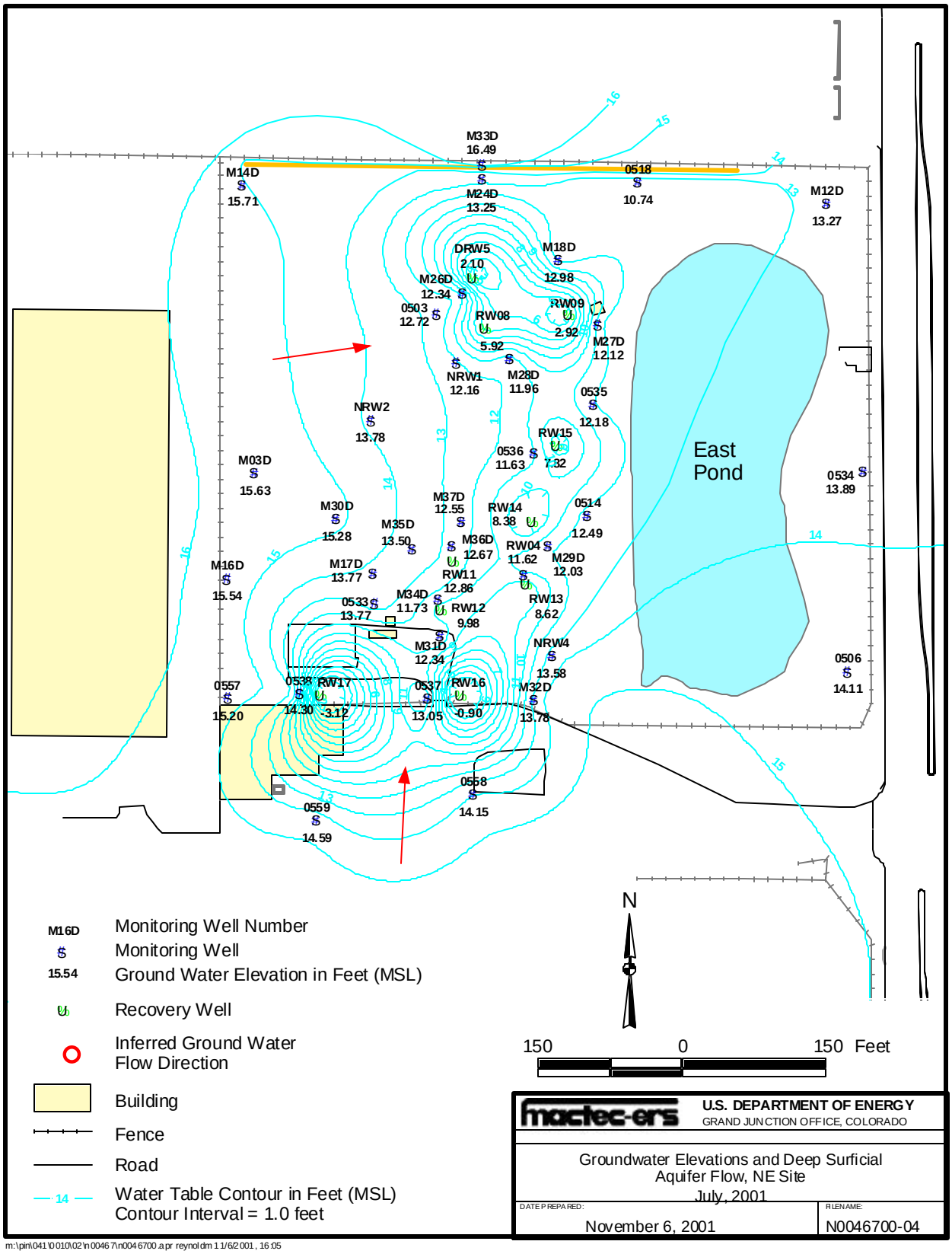

Figure 4. Groundwater Elevations and Deep Surficial Aquifer Flow, Northeast Site, July 2001

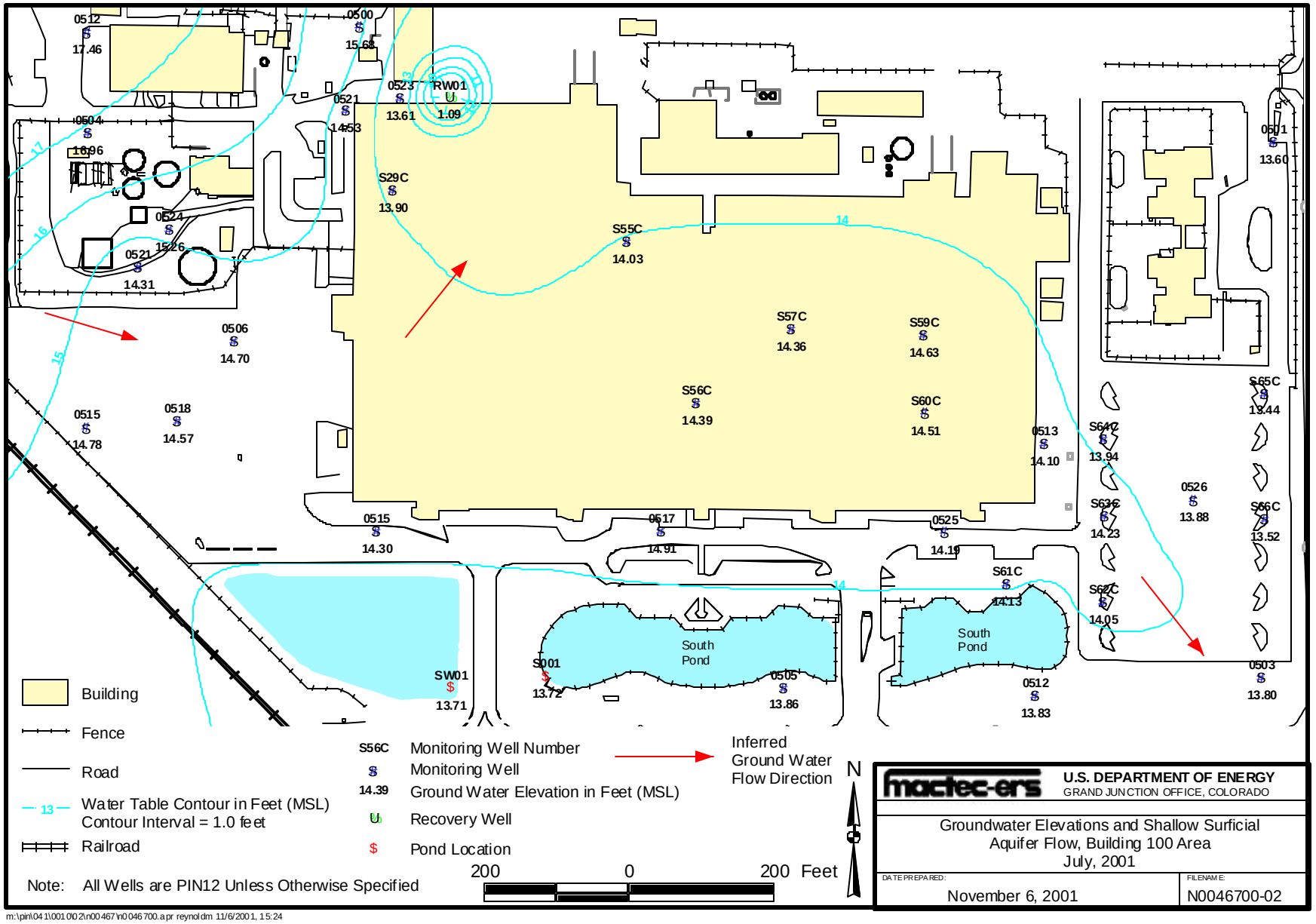

Figure 5. Groundwater Elevations and Shallow Surficial Aquifer Flow, Building 100 Area, July 2001

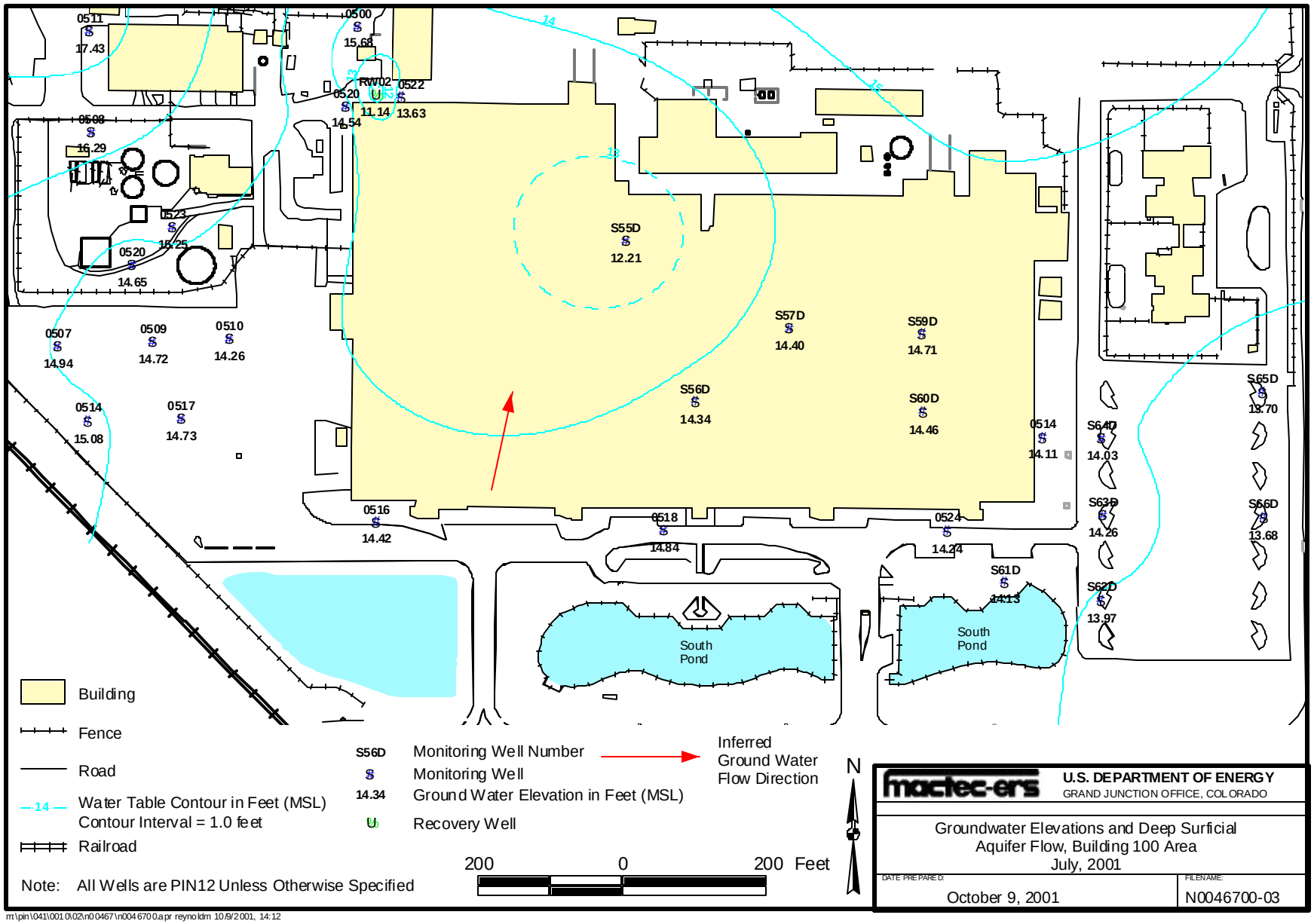

Figure 6. Groundwater Elevations and Deep Surficial Aquifer Flow, Building 100 Area, July 2001

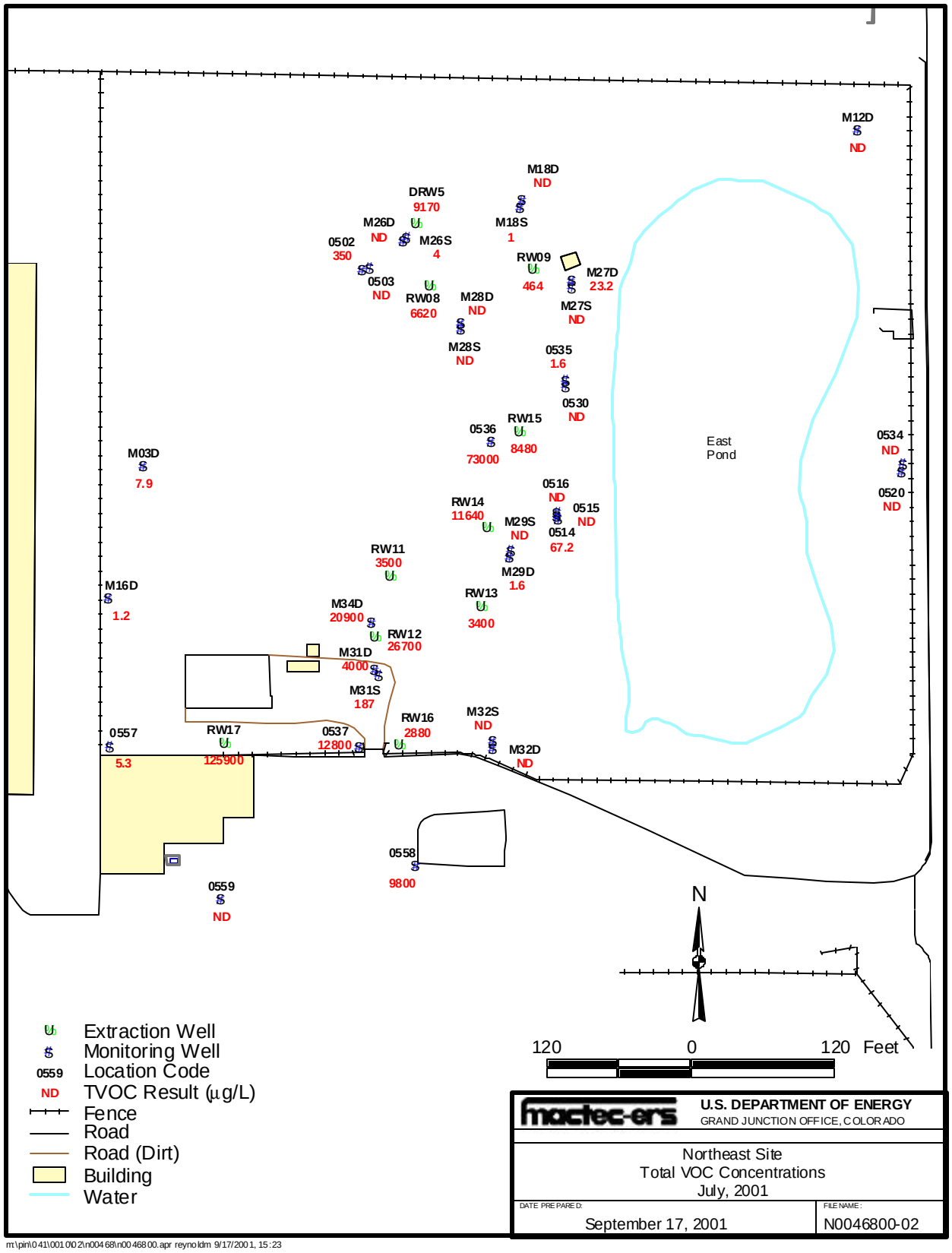

Figure 7. Total VOCs Concentrations at the Northeast Site, July 2001
(wells without VOC values or "NDs" were not sampled during this quarter)

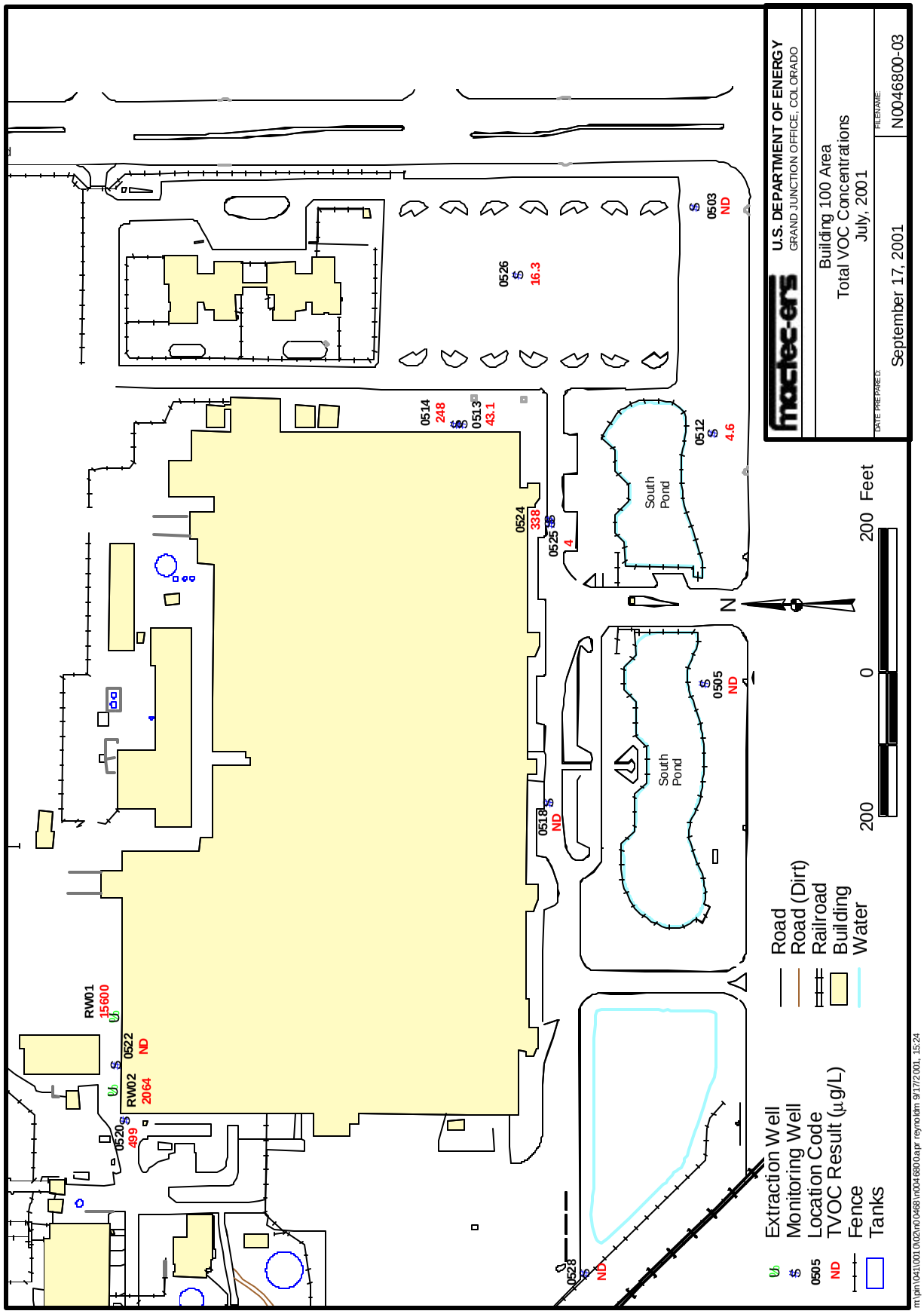

Figure 8. Total VOCs Concentrations at Building 100, July 2001

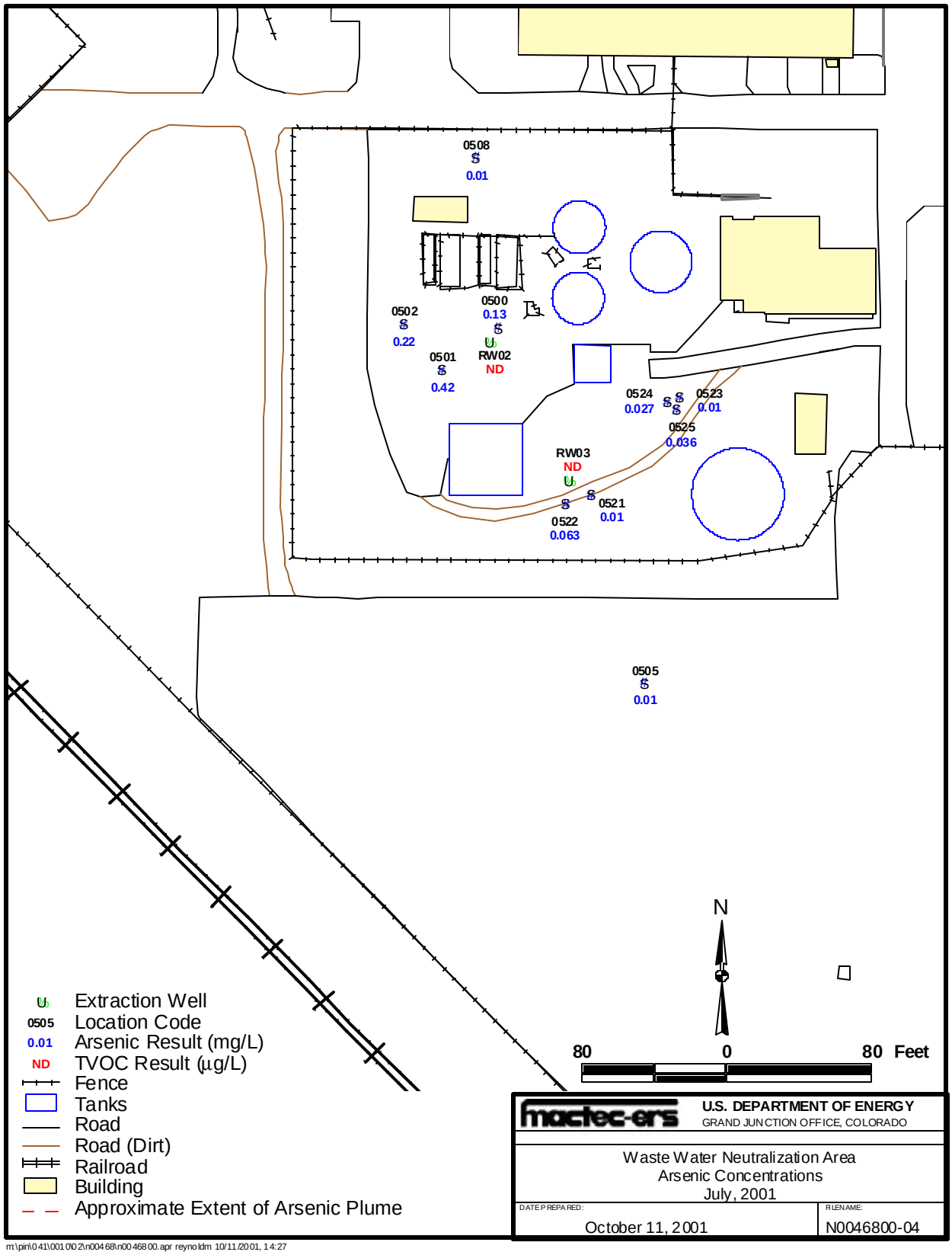

Figure 9. Arsenic Concentrations at the WWNA, July 2001

Table 1. WWNA Recovery Well Startup Monitoring Arsenic Concentrations (mg/L)

Sample Date	RW02	RW03	RW02/RW03 Combined Effluent
2/26/2001	0.08	0.1	0.095
2/27/2001	0.074	0.1	0.091
2/28/2001	0.074	0.091	0.074
3/1/2001	0.084	0.096	0.088
3/2/2001	0.088	0.095	0.089
3/5/2001	0.13	0.22	0.1
3/12/2001	0.37	0.11	0.13
3/19/2001	0.42	0.12	0.12
3/26/2001	0.15	0.16	0.8
4/2/2001	0.18	0.12	0.13
4/16/2001	0.18	0.17	0.13
5/1/2001	0.16	0.071	0.1
5/15/2001	0.14	0.15	0.093
5/30/2001	0.13	0.07	0.16
6/11/2001	0.11	0.068	0.083
6/26/2001	0.13	0.067	0.096
7/9/2001	0.14	0.054	0.087
7/23/2001	0.14	0.25	0.074
8/6/2001	0.11	0.2	0.18
8/21/2001	0.13	0.074	0.084
9/5/2001	0.13	0.054	0.091

Table 2. Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT DATE	MEASUREMENT TIME	WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
PIN02	PINELLAS WEST POND				
502D	07/09/2001	10:50	2.60	15.90	
PIN05	PINELLAS TRENCH SITE				
0500	07/09/2001	10:39	1.47	17.03	
PIN06	PINELLAS OLD DRUM STORAGE SITE				
0500	07/09/2001	10:48	2.96	15.04	
0501	07/09/2001	10:52	3.73	14.57	
PIN09	PINELLAS INCINERATOR SITE				
0500	07/09/2001	10:49	2.94	15.03	
PIN10	PINELLAS INCINERATOR DITCH				
0500	07/09/2001	10:55	2.22	15.68	
PIN12	INDUSTRIAL DRAIN LEAKS BUILDING 100				
0508	07/09/2001	11:04	3.86	14.50	
0509	07/09/2001	11:03	3.99	14.05	
0510	07/09/2001	11:01	4.37	13.69	
0511	07/09/2001	14:04	3.34	14.46	
0512	07/09/2001	14:07	2.29	14.52	
0513	07/09/2001	11:31	4.40	14.10	
0514	07/09/2001	11:31	4.39	14.11	
0515	07/09/2001	14:09	3.60	14.30	
0516	07/09/2001	14:09	3.58	14.42	
0517	07/09/2001	10:23	2.99	14.91	
0518	07/09/2001	10:23	3.10	14.84	
0520	07/09/2001	10:47	3.47	14.54	
0521	07/09/2001	10:47	3.52	14.53	
0522	07/09/2001	10:45	4.57	13.63	
0523	07/09/2001	10:53	4.55	13.61	
0524	07/09/2001	11:27	3.17	14.24	
0525	07/09/2001	11:27	3.23	14.19	
0526	07/09/2001	15:08	2.94	13.88	
0527	07/09/2001	13:47	10.36	7.71	
0528	07/09/2001	13:53	10.02	7.58	

Table 2 (continued). Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT		WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
	DATE	TIME			
PIN12	INDUSTRIAL DRAIN LEAKS BUILDING 100				
RW01	07/09/2001	10:57	17.16	1.09	
RW02	07/09/2001	10:52	7.19	11.14	
S29C	07/09/2001	11:13	4.61	13.90	
S30B	07/09/2001	09:29	4.86	13.65	
S31B	07/09/2001	09:16	4.01	14.50	
S32B	07/09/2001	09:13	4.56	13.95	
S33C	07/09/2001	09:20	4.83	13.68	
S35B	07/09/2001	09:42	4.94	13.57	
S36B	07/09/2001	09:07	4.28	14.23	
S37B	07/09/2001	09:24	4.81	13.70	
S54D	07/09/2001	09:39	4.60	13.91	
S55B	07/09/2001	10:06	4.53	13.98	
S55C	07/09/2001	10:07	4.48	14.03	
S55D	07/09/2001	10:07	6.30	12.21	
S56B	07/09/2001	10:30	4.09	14.42	
S56C	07/09/2001	10:30	4.12	14.39	
S56D	07/09/2001	10:30	4.17	14.34	
S57B	07/09/2001	10:37	4.18	14.33	
S57C	07/09/2001	10:36	4.15	14.36	
S57D	07/09/2001	10:36	4.11	14.40	
S59B	07/09/2001	08:52	3.98	14.53	
S59C	07/09/2001	08:52	3.88	14.63	
S59D	07/09/2001	08:52	3.80	14.71	
S60B	07/09/2001	08:48	3.59	14.92	
S60C	07/09/2001	08:48	4.00	14.51	
S60D	07/09/2001	08:48	4.05	14.46	
S61B	07/09/2001	14:33	3.57	14.43	
S61C	07/09/2001	14:33	3.87	14.13	
S61D	07/09/2001	14:33	3.87	14.13	

Table 2 (continued). Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT DATE	MEASUREMENT TIME	WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
PIN12	INDUSTRIAL DRAIN LEAKS BUILDING 100				
S62B	07/09/2001	14:47	1.51	14.40	
S62C	07/09/2001	14:47	1.86	14.05	
S62D	07/09/2001	14:47	1.94	13.97	
S63B	07/09/2001	14:52	2.47	14.18	
S63C	07/09/2001	14:52	2.42	14.23	
S63D	07/09/2001	14:52	2.39	14.26	
S64B	07/09/2001	15:00	4.30	13.68	
S64C	07/09/2001	15:00	4.04	13.94	
S64D	07/09/2001	15:00	3.95	14.03	
S65B	07/09/2001	15:04	4.74	13.21	
S65C	07/09/2001	15:04	4.51	13.44	
S65D	07/09/2001	15:04	4.25	13.70	
S66B	07/09/2001	15:10	2.82	13.71	
S66C	07/09/2001	15:10	3.01	13.52	
S66D	07/09/2001	15:10	2.85	13.68	
TE03	07/09/2001	14:05	2.60	14.40	
PIN15	PINELLAS NORTHEAST SITE				
0502	07/09/2001	13:56	3.39	14.41	
0503	07/09/2001	13:57	5.28	12.72	
0506	07/09/2001	12:03	2.89	14.11	
0507	07/09/2001	12:05	2.89	14.11	
0510	07/09/2001	15:22	3.16	14.36	
0513	07/09/2001	11:58	10.17	7.43	
0514	07/09/2001	11:33	5.01	12.49	
0515	07/09/2001	11:35	5.01	12.49	
0516	07/09/2001	11:36	3.39	14.01	
0518	07/09/2001	11:50	7.06	10.74	
0520	07/09/2001	12:01	3.17	14.03	
0523	07/09/2001	14:13	2.18	15.82	
0530	07/09/2001	11:40	6.63	10.77	

Table 2 (continued). Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT DATE	MEASUREMENT TIME	WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
PIN15	PINELLAS NORTHEAST SITE				
0531	07/09/2001	13:54	3.03	14.57	
0533	07/09/2001	14:46	4.23	13.77	
0534	07/09/2001	12:00	3.41	13.89	
0535	07/09/2001	11:41	5.42	12.18	
0536	07/09/2001	11:39	5.97	11.63	
0537	07/09/2001	11:13	5.55	13.05	
0538	07/09/2001	14:28	4.50	14.30	
0557	07/09/2001	14:25	3.90	15.20	
0558	07/09/2001	11:05	4.09	14.15	
0559	07/09/2001	10:58	4.20	14.59	
B002	07/09/2001	13:58	5.45	12.55	
B003	07/09/2001	13:32	4.82	12.48	
B004	07/09/2001	13:59	5.69	12.71	
B005	07/09/2001	13:29	5.11	12.49	
DRW5	07/09/2001	13:43	15.50	2.10	
M03D	07/09/2001	14:15	2.47	15.63	
M03S	07/09/2001	14:16	2.14	15.96	
M12D	07/09/2001	11:53	3.93	13.27	
M12S	07/09/2001	11:55	3.38	14.12	
M14D	07/09/2001	14:08	2.29	15.71	
M14S	07/09/2001	14:09	1.99	16.01	
M16D	07/09/2001	14:20	2.66	15.54	
M16S	07/09/2001	14:21	2.63	15.57	
M17D	07/09/2001	14:39	3.83	13.77	
M17S	07/09/2001	14:40	2.28	15.22	
M18D	07/09/2001	11:48	4.22	12.98	
M18S	07/09/2001	11:47	2.87	14.33	
M24D	07/09/2001	13:50	4.55	13.25	
M26D	07/09/2001	13:42	5.36	12.34	

Table 2 (continued). Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT DATE	MEASUREMENT TIME	WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
PIN15	PINELLAS NORTHEAST SITE				
M26S	07/09/2001	13:40	3.86	13.74	
M27D	07/09/2001	11:45	5.48	12.12	
M27S	07/09/2001	11:44	4.08	13.52	
M28D	07/09/2001	13:25	5.64	11.96	
M28S	07/09/2001	13:26	3.59	14.11	
M29D	07/09/2001	11:29	5.57	12.03	
M29S	07/09/2001	11:29	3.46	14.14	
M30D	07/09/2001	14:36	2.62	15.28	
M30S	07/09/2001	14:37	2.27	15.53	
M31D	07/09/2001	11:21	5.66	12.34	
M31S	07/09/2001	11:20	5.06	12.94	
M32D	07/09/2001	11:24	4.02	13.78	
M32S	07/09/2001	11:25	6.64	11.16	
M33D	07/09/2001	13:52	1.11	16.49	
M34D	07/09/2001	13:11	6.37	11.73	
M35D	07/09/2001	15:09	4.50	13.50	
M36D	07/09/2001	13:13	5.13	12.67	
M37D	07/09/2001	15:10	5.45	12.55	
NRW1	07/09/2001	15:25	6.04	12.16	
NRW2	07/09/2001	15:23	4.12	13.78	
NRW4	07/09/2001	11:26	3.62	13.58	
RW03	07/09/2001	15:13	4.46	13.44	
RW04	07/09/2001	13:15	5.98	11.62	
RW06	07/09/2001	14:50	7.84	10.16	
RW07	07/09/2001	13:17	5.87	11.73	
RW08	07/09/2001	13:30	11.78	5.92	
RW09	07/09/2001	13:22	14.58	2.92	
RW10	07/09/2001	15:02	4.96	12.94	
RW11	07/09/2001	15:20	5.14	12.86	

Table 2 (continued). Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT DATE	MEASUREMENT TIME	WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
PIN15	PINELLAS NORTHEAST SITE				
RW12	07/09/2001	13:09	8.32	9.98	
RW13	07/09/2001	13:16	8.98	8.62	
RW14	07/09/2001	11:32	9.52	8.38	
RW15	07/09/2001	11:38	9.38	7.82	
RW16	07/09/2001	11:23	18.90	-0.90	
RW17	07/09/2001	14:30	21.92	-3.12	
PIN18	WASTEWATER NEUTRALIZATION AREA				
0500	07/09/2001	13:09	5.64	14.46	
0501	07/09/2001	13:06	4.56	15.44	
0502	07/09/2001	13:05	3.76	16.24	
0503	07/09/2001	13:56	2.58	15.10	
0504	07/09/2001	13:03	2.64	16.96	
0505	07/09/2001	14:00	3.12	14.76	
0506	07/09/2001	14:02	3.01	14.70	
0507	07/09/2001	13:56	2.79	14.94	
0508	07/09/2001	13:04	3.21	16.29	
0509	07/09/2001	13:59	3.11	14.72	
0510	07/09/2001	14:02	3.50	14.26	
0511	07/09/2001	13:17	1.37	17.43	
0512	07/09/2001	13:17	1.14	17.46	
0513	07/09/2001	13:17	1.30	17.50	
0514	07/09/2001	14:16	2.70	15.08	
0515	07/09/2001	14:16	3.63	14.78	
0516	07/09/2001	14:16	3.45	14.96	
0517	07/09/2001	14:14	3.52	14.73	
0518	07/09/2001	14:14	3.63	14.57	
0519	07/09/2001	14:14	3.92	14.36	
0520	07/09/2001	13:12	3.35	14.65	
0521	07/09/2001	13:12	3.79	14.31	
0522	07/09/2001	13:12	3.73	14.37	

Table 2 (continued). Water-Level Data at the Pinellas STAR Center

WELL ID	MEASUREMENT DATE	MEASUREMENT TIME	WATER DEPTH FROM LAND SURFACE (FT)	GROUND WATER ELEVATION (FT NGVD)	WATER LEVEL FLAG
PIN18	WASTEWATER NEUTRALIZATION AREA				
0523	07/09/2001	13:13	4.15	15.25	
0524	07/09/2001	13:13	3.74	15.26	
0525	07/09/2001	13:13	3.51	15.39	
0526	07/09/2001	13:20	0.87	17.73	
RW02	07/09/2001	13:10	10.25	9.85	
RW03	07/09/2001	13:11	8.38	9.92	
PIN21	PINELLAS PERIMETER MONITOR WELLS				
0500	07/09/2001	15:16	4.52	13.58	
0501	07/09/2001	15:16	4.40	13.60	
0502	07/09/2001	14:43	1.17	14.03	
0503	07/09/2001	14:44	1.40	13.80	
0504	07/09/2001	14:27	3.67	13.93	
0505	07/09/2001	14:27	3.54	13.86	
0512	07/09/2001	14:40	3.47	13.83	

WATER LEVEL FLAGS:

Table 3. Floridan Monitoring Well Water Level Information

Well Identification	Previous Water Level Elevation (ft, MSL)	Current Water Level Elevation (ft, MSL)
PIN15–0513	7.38	7.43
PIN12–0527	7.53	7.71
PIN12–0528	7.48	7.58

Table 4. Vertical Hydraulic Differential

Water Level Measured From	Well Identification	Water Level Elevation (ft, MSL)
Deep Surficial Aquifer	PIN15–M12D	13.27
Floridan Aquifer	PIN15–0513	7.43

Table 5. Surface Water Measurements

Pond Location	Previous Water Level Elevation (ft, MSL)	Current Water Level Elevation (ft, MSL)
East Pond	14.32	13.96
South Pond	13.67	13.72
West Pond	15.27	NM
Southwest Pond	13.68	13.71

Table 6. Field Measurements of Samples Collected at the Pinellas STAR Center

Well ID	Temperature (°C)	Specific Conductance (µmhos/cm)[a]	Turbidity (NTU)	pH	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)
PIN12	**Industrial Drain Leaks Building 100**					
0513	24.4	580	6.4	6.67	24	1.5
0514	24.4	1,351	17.6	6.56	-44	0.93
0518	27.8	774	22	6.65	-58	0.98
0520	27.7	1,480	76.5	6.68	1.7	1
0522	25.6	1,339	7.8	6.65	-15	0.74
0524	26.9	1,396	4.9	6.5	-82	1.09
0525	27.2	662	7.1	6.75	-86	1
0526	30.2	2,156	14.2	6.47	-82	1.34
0528	25.15	1,213	4.6	6.82	-216	1.83
RW01	27.41	1,037	17.1	6.62	-61.8	0.92
RW02	27.15	856	-.3	6.7	-70.8	1.18
PIN15	**Northeast Site**					
0502	27.42	1,662	13.6	6.25	-38.7	0.45
0503	24.79	1,028	121.7	6.54	-108.3	0.42
0514	25.37	708	92.6	6.34	-100.8	0.69
0515	25.91	579	7.2	7.08	0	0.43
0516	26.69	659	4.7	7.05	144.7	4.65
0520	27.6	328	14.6	6.47	24.4	0.82
0530	26.18	679	31.8	7.05	-79.8	0.23
0534	26.1	1,785	19.3	6.58	-24.9	0.97
0535	24.74	1,837	150.3	6.59	-67.8	0.35
0536	24.85	1,655	88.5	6.36	-14.2	1.08
0537	27.37	1,100	5.1	6.63	-24.3	0.49
0557	24.64	1,143	129.4	6.74	-31.1	0.44
0558	27.1	1,221	27.5	6.58	-43	0.99
0559	28.2	1,380	31.4	6.65	4.7	0.93
DRW5	25.47	1,092	0	6.51	-80.9	0.87
M03D	26.1	1,389	32.4	6.43	-38	0.41
M12D	24.9	989	41.5	6.69	-57	0.75
M16D	26.28	874	39.2	6.73	-33.4	0.45
M18D	26.99	2,014	221.5	6.64	-142.4	0.19
M18S	28.99	821	19.7	6.89	97.6	3.42
M26D	25.58	1,645	10.4	6.64	-174.2	0.29
M26S	27.72	1,224	8.5	6.18	105	0.75
M27D	24.19	1,961	148	6.57	-120.6	0.49
M27S	25.95	681	4.1	7.09	42.8	0.29
M28D	25.56	1,902	63.4	6.63	-92.2	0.18
M28S	27.06	1,475	4.9	6.49	-29.4	0.43
M29D	24.65	272	2	6.26	-93.4	0.64
M29S	26.96	1,073	7.9	6.75	26.1	0.52

Table 6 (continued). Field Measurements of Samples Collected at the Pinellas STAR Center

Well ID	Temperature (°C)	Specific Conductance (µmhos/cm)[a]	Turbidity (NTU)	pH	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)
PIN15	**Northeast Site (continued)**					
M31D	25.35	1,465	8.4	6.54	-25.1	0.49
M31S	26.35	1,443	6.3	6.78	-78.5	0.4
M32D	26.87	1,451	1	6.44	-38.6	0.43
M32S	29.28	839	-.4	6.69	74.2	0.6
M34D	24.81	1,142	18.5	6.53	-41.5	0.45
RW11	24.6	1,730	158	7.16	-66.4	8.23
RW16	26.2	1,659	1.7	6.52	-30.8	0.88
RW17	24	1,872	2.7	6.39	-105	0.7
PIN18	**Wastewater Neutralization Area**					
0500	25.99	382	9.9	7	-123.9	0.59
0501	25.7	901	2.4	6.7	-63	0.83
0502	26.13	860	15.1	6.66	-75.9	0.95
0505	28.8	777	45.5	6.76	-81	0.9
0508	25.5	980	20	6.71	-103	0.82
0521	24.89	915	0.3	6.67	-100.7	0.76
0522	27.7	735	23.5	6.55	79.5	1.05
0523	25.2	885	22.6	6.72	-73	0.76
0524	25.4	552	6.1	6.82	-112	0.76
0525	28.5	429	11.4	6.53	56.8	1.26
RW02	25.72	555	5.8	6.89	-127	0.69
RW03	26.88	688	0.4	6.72	-88.6	0.85
PIN21	**Perimeter Monitor Wells**					
0503	26	851	12.3	6.61	-149	0.75
0505	24.3	840	41	6.6	-83	0.91
0512	24.32	1,006	95	6.58	-94	1.06

[a]temperature corrected to 25°C

Table 7. Total VOCs in Samples Collected at the Pinellas STAR Center (reported in micrograms per liter)

Well ID	1,1-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Chloro-ethane	TCE	Methylene Chloride	Vinyl Chloride	Total VOCs[a]
PIN12	**Industrial Drain Leaks Building 100**								
0513	<1	8.1	0.88J	<1	19	16	<1	<5	43.1
0514	<2.5	61	61	<2.5	110	16	<2.5	<12	248
0518	<1	<1	<1	<1	<1	<1	<1	<5	ND
0520	<10	440	<10	<10	59	<10	<10	32J	499[b]
0522	<1	<1	<1	<1	<1	<1	<1	3J	ND
0524	<5	260	3J	<5	78	<5	<5	6.4J	338
0525	<1	4	<1	<1	<1	<1	<1	0.42J	4
0526	<1	8.3	4	<1	4	0.16J	<1	<5	16.3
0528	<1	<1	<1	<1	<1	<1	<1	<5	ND
RW01	10,000	5,600	<250	<250	<250	<250	<250	680J	15,600
RW02	1,200	790	74	9.8J	<25	<25	<25	79J	2,064[c]
PIN15	**Northeast Site**								
0502	2.2J	<5	<5	<5	<5	<5	<5	350	350
0503	<1	<1	<1	<1	<1	<1	<1	0.47J	ND
0514	<1	<1	<1	<1	28	<1	<1	0.3J	67.2[b,c]
0515	<1	<1	<1	<1	<1	<1	<1	0.86J	ND
0516	<1	<1	<1	<1	<1	<1	<1	1.1J	ND
0520	<1	<1	<1	<1	<1	<1	<1	1.4J	ND
0530	<1	<1	<1	<1	<1	<1	<1	<5	ND
0534	<1	<1	<1	<1	<1	<1	<1	<5	ND
0535	0.12J	<1	<1	<1	<1	<1	<1	0.88J	1.6[b]
0536	33,000	40,000	880J	<1,000	<1,000	<1,000	<1,000	<5,000	73,000[c]
0537	52J	11,000	<250	<250	1,800	<250	<250	<1,200	12,800
0557	<1	<1	<1	<1	4.1	<1	<1	0.34J	5.3[b,c]
0558	<250	<250	<250	<250	9,800	<250	<250	<1,200	9,800[b]
0559	<1	<1	<1	<1	<1	<1	<1	2.8J	ND[b]
DRW5	1,800	4,500	<100	<100	570	<100	<100	200J	9,170[b]
M03D	<1	<1	<1	<1	4.9	<1	<1	0.55J	7.9[b]
M12D	<1	<1	<1	<1	<1	<1	<1	0.91J	ND
M16D	<1	<1	<1	<1	1.2	<1	<1	0.74J	1.2[c]
M18D	<1	<1	<1	<1	<1	<1	<1	0.3J	ND
M18S	<1	<1	<1	<1	<1	<1	<1	1.2J	1[b]
M26D	<1	<1	<1	<1	<1	<1	<1	0.7J	ND
M26S	4	0.21J	<1	<1	<1	<1	<1	0.74J	4
M27D	<1	<1	<1	<1	<1	<1	<1	1.8J	23.2[b,c]
M27S	<1	<1	<1	<1	<1	<1	<1	1.4J	ND
M28D	<1	<1	<1	<1	<1	<1	<1	0.56J	ND

Table 7 (continued). Total VOCs in Samples Collected at the Pinellas STAR Center (reported in micrograms per liter)

Well ID	1,1-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Chloro-ethane	TCE	Methylene Chloride	Vinyl Chloride	Total VOCs[a]
PIN15	**Northeast Site (continued)**								
M28S	<1	0.68J	<1	<1	<1	<1	<1	0.94J	ND[b]
M29D	<1	<1	<1	<1	<1	<1	<1	<5	1.6 [b]
M29S	<1	<1	<1	<1	<1	<1	<1	<5	ND
M31D	<50	1,800	<50	<50	1,200	<50	<50	27J	3,000[b]
M31S	<10	47	<10	<10	140	<10	<10	<50	187 [b]
M32D	<1	<1	<1	<1	<1	<1	<1	0.3J	ND [b]
M32S	<1	<1	<1	<1	<1	<1	<1	<5	ND
M34D	<500	1,900	<500	<500	19,000	<500	<500	520J	20,900 [b]
RW06	34,000	40,000	<5,000	<5,000	<5,000	<5,000	<5,000	330,000	432,200 [b,c]
RW08	200	2,500	10J	16J	1,300	<50	<50	1,700	6,620 [b]
RW09	<5	0.79J	<5	<5	140	<5	<5	24J	464 [b]
RW11	<50	<50	<50	<50	1900	<50	<50	<250	3,500 [b]
RW12	470J	13,000	<500	<500	11,000	<500	<500	1,300J	26,700 [b]
RW13	<50	170	<50	<50	170	<50	<50	2,800	3,400 [b]
RW14	120J	2,800	<250	<250	2,000	<250	<250	5,400	11,640 [b,c]
RW15	3,200	4,300	<100	<100	980	<100	<100	240J	8,480 [b]
RW16	<50	680	7J	<50	2200	<50	<50	16J	2,880 [b]
RW17	<1,000	82,000	<1,000	110J	40,000	<1,000	<1,000	560J	125,900 [b]
PIN18	**Wastewater Neutralization Area**								
RW02	<1	<1	<1	<1	<1	<1	<1	<5	ND
RW03	<1	0.32J	<1	<1	<1	<1	<1	0.43J	ND
PIN21	**Perimeter Monitor Wells**								
0503	<1	<1	<1	<1	<1	<1	<1	0.41J	ND
0505	<1	<1	<1	<1	<1	<1	<1	<5	ND
0512	<1	1.5	<1	<1	3.1	<1	<1	0.45J	4.6

[a]"J" values are not included in the "Total VOCs" value.
[b]See the "BTEX Table" for additional analytical results.
[c]See the "Additional VOCs Table" for additional analytical results.
ND Not detected.
J Estimated value, result is between the reporting limit and the method detection limit.

Table 8. BTEX Compounds in Samples Collected at the Pinellas STAR Center (reported in micrograms per liter)

Well ID	Benzene	Toluene	Ethylbenzene	Total Xylenes[a]	Total BTEX[b]
PIN12	**Industrial Drain Leaks Building 100**				
0513	<1	<1	<1	ND	ND
0514	<2.5	<2.5	<2.5	ND	ND
0518	<1	<1	<1	ND	ND
0520	<10	1.5J	<10	ND	ND
0522	<1	<1	<1	ND	ND
0524	<5	<5	<5	ND	ND
0525	<1	<1	<1	ND	ND
0526	<1	<1	<1	ND	ND
0528	<1	<1	<1	ND	ND
RW01	<250	<250	<250	ND	ND
RW02	<25	<25	<25	ND	ND
PIN15	**Northeast Site**				
0502	<5	<5	<5	ND	ND
0503	<1	<1	<1	ND	ND
0514	11	23	0.73J	3.4	37.4
0515	<1	<1	<1	ND	ND
0516	<1	<1	<1	ND	ND
0520	<1	<1	<1	ND	ND
0530	<1	<1	<1	ND	ND
0534	<1	<1	<1	ND	ND
0535	1.6	0.64J	<1	ND	1.6
0536	<1,000	<1,000	<1,000	ND	ND
0537	<250	<250	<250	ND	ND
0557	0.13J	<1	<1	ND	ND
0558	28J	<250	<250	30J	ND
0559	<1	0.14J	<1	ND	ND
DRW5	14J	2,300	<100	ND	2,300
M03D	0.31J	<1	<1	3	3
M12D	<1	<1	<1	ND	ND
M16D	<1	<1	<1	ND	ND
M18D	<1	<1	<1	ND	ND
M18S	<1	<1	<1	1	1
M26D	<1	<1	<1	ND	ND
M26S	<1	<1	<1	ND	ND
M27D	19	2.5	0.68J	1.7	23.2
M27S	<1	<1	<1	ND	ND
M28D	<1	<1	<1	ND	ND
M28S	0.12J	<1	<1	ND	ND
M29D	1.6	<1	<1	1.01J	1.6

Table 8 (continued). BTEX Compounds in Samples Collected at the Pinellas STAR Center (reported in micrograms per liter)

Well ID	Benzene	Toluene	Ethylbenzene	Total Xylenes[a]	Total BTEX[b]
PIN15	**Northeast Site (continued)**				
M29S	<1	<1	<1	ND	ND
M31D	18J	17J	<50	ND	ND
M31S	3.2J	<10	<10	ND	ND
M32D	0.78J	<1	0.25J	ND	ND
M32S	<1	<1	<1	ND	ND
M34D	<500	320J	<500	ND	ND
RW06	<5,000	19,000	<5,000	ND	19,000
RW08	8J	920	<50	ND	920
RW09	14	310	1.1J	3.76J	324
RW11	18J	1,600	<50	ND	1,600
RW12	<500	2,700	<500	ND	2,700
RW13	23J	260	<50	ND	260
RW14	<250	820	190J	620	1,440
RW15	<100	23J	<100	ND	ND
RW16	6.8J	8.4J	<50	ND	ND
RW17	<1,000	3,900	<1,000	ND	3,900
PIN18	**Wastewater Neutralization Area**				
RW02	<1	<1	<1	ND	ND
RW03	<1	<1	<1	ND	ND
PIN21	**Perimeter Monitor Wells**				
0503	<1	<1	<1	ND	ND
0505	<1	<1	<1	ND	ND
0512	<1	<1	<1	ND	ND

[a] m-, o-, p- Xylene if detected.
[b] "J" values are not included in the "Total BTEX" value.
ND Not detected.
J Estimated value, result is between the reporting limit and the method detection

Table 9. Additional Total VOCs in Samples Collected at the Pinellas STAR Center (reported in milligrams per liter)

Well ID	1,2-Dichloro-propane	Bromo-methane	Dichloro-difluoro-methane	MTBE	Trichloro-fluoro-methane
PIN12	**Industrial Drain Leaks Building 100**				
RW02				110J	
PIN15	**Northeast Site**				
0514		1.8		2.4J	
0536				2,300J	
0557					1.2
M16D					0.14J
M27D			0.42J		0.31J
RW14	110J				

J Estimated value, result is between the reporting limit and the method detection limit.

Table 10. Arsenic Concentrations at the WWNA (reported in milligrams per liter)

Well	Date	Arsenic
0500	7/12/2001	0.13
0501	7/13/2001	0.42
0502	7/13/2001	0.22
0505	7/12/2001	<0.01
0508	7/13/2001	<0.01
0521	7/12/2001	<0.01
0522	7/12/2001	0.063
0523	7/12/2001	<0.01
0524	7/12/2001	0.027
0525	7/12/2001	0.036
RW02	7/9/2001	0.14
RW02	7/23/2001	0.14
RW02	8/6/2001	0.11
RW02	8/21/2001	0.13
RW02	9/5/2001	0.13
RW03	7/9/2001	0.054
RW03	7/23/2001	0.25
RW03	8/6/2001	0.2
RW03	8/21/2001	0.074
RW03	9/5/2001	0.054

Table 11. Summary of Analytical Results for Groundwater Samples Collected at the Northeast Site Treatment System
(reported in micrograms per liter unless otherwise noted)

Well ID	Date Sampled	cis-1,2-DCE	trans-1,2-DCE	TCE	Methylene chloride	Vinyl chloride	Toluene	Benzene	MTBE	Total VOCs[a]	$CaCO_3$ mg/L	Fe mg/L
PIN15	**Northeast Site**											
INF1	7/2/01	4,900	<100	1,300	2,400	1,300	900	<100	<1,000	10,800	430	4.3
INF1	7/3/01	3,800	<100	920	790	1,200	390	<100	<1,000	7,100	--	--
INF1	7/5/01	5,100	<100	2,000	6,300	1,200	840	19J	<1,000	15,440	--	--
INF1	7/6/01	5,800	<100	2,200	7,400	1,300	980	24J	<1,000	17,680	--	--
INF1	7/9/01	5,100	<100	1,800	7,400	1,100	780	18J	<1,000	16,180	--	--
INF1	7/18/01	6,400	<250	2,600	14,000	1,800	1,300	<250	<2,500	26,100	480	4.3
INF1	7/23/01	6,300	<250	3,500	19,000	1,700	1,600	<250	<2,500	32,100	--	--
INF1	8/2/01	6,700	<250	2,400	16,000	1,500	1,200	<250	<2,500	27,800	510	4
INF1	8/13/01	4,800	<250	1,800	12,000	880	1,200	32J	<2,500	20,680	420	3.5
INF1	8/28/01	4,400	<250	2,100	12,000	1,300	740	<250	<2,500	20,540	--	--
INF1	9/5/01	4,800	<100	660	5,100	1,000	820	<100	<1,000	12,380	550	9.4
INF1	9/18/01	5,600	<100	910	7,500	1,600	930	<100	<1,000	16,540	510	4.5
EFF1	7/2/01	0.29J	<1	<1	0.94J	<1	<1	<1	<10	1(b)	410	4.2
EFF1	7/18/01	<1	<1	<1	1J	<1	<1	<1	<10	ND	510	3.9
EFF1	8/2/01	<1	<1	<1	1.6J	<1	0.74J	0.24J	<10	ND	490	3.6
EFF1	8/13/01	<1	<1	<1	0.68J	<1	0.22J	0.2J	<10	ND	530	4.5
EFF1	9/5/01	0.32J	<1	<1	1J	<1	0.14J	<1	<10	ND	530	3.5
EFF1	9/18/01	<1	<1	<1	<5	<1	<1	<1	<10	ND	500	3.5
CWL1(c)	7/2/01	--	--	--	--	--	--	--	--	--	430	20
CWL1	7/18/01	--	--	--	--	--	--	--	--	--	510	4.4
CWL1	8/2/01	--	--	--	--	--	--	--	--	--	450	3.5
CWL1	8/13/01	--	--	--	--	--	--	--	--	--	450	3.7
CWL1	9/5/01	--	--	--	--	--	--	--	--	--	510	3.9
CWL1	9/18/01	--	--	--	--	--	--	--	--	--	500	4.1

[a]"J" values are not included in the "Total VOCs" value.
[b]Total VOCs value includes compounds not listed.
[c]CWL1 is the clear well. A holding tank after the pretreatment system and before the air stripper tower.
ND Not detected.
J Estimated value, result is between the reporting limit and the method detection limit.
-- Not Measured

Table 12. Estimated Mass of VOCs Recovered from the Northeast Site and Building 100 Recovery Wells During July, August, and September 2001

Month	Volume Treated (gallons)	Concentration[a]						
		cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	Toluene (µg/L)	TCE (µg/L)	Methylene Chloride (µg/L)	Vinyl Chloride (µg/L)	Total VOCs (µg/L)
July 2001	768,293	5,343	71	970	2,046	8,184	1,371	17,986
August 2001	887,485	5,300	125	1,047	2,100	13,333	1,227	23,132
September 2001	606,455	5,200	50	875	785	6,300	1,300	14,510

Month	Volume Treated (gallons)	Recovery[b]						
		cis-1,2-DCE (lbs)	trans-1,2-DCE (lbs)	Toluene (lbs)	TCE (lbs)	Methylene Chloride (lbs)	Vinyl Chloride (lbs)	Total VOCs (lbs)
July 2001	768,293	34.3	0.5	6.2	13.1	52.5	8.8	115.3
August 2001	887,485	39.3	0.9	7.8	15.6	98.8	9.1	171.3
September 2001	606,455	26.3	0.3	4.4	4.0	31.9	6.6	73.4

[a]These concentrations represent the average of weekly sampling results.
[b]Includes "J" (estimated) values. For any detection of "<", which indicates the laboratory could not detect that analyte, 50 percent of the "<" value was used for the calculation of recovery.

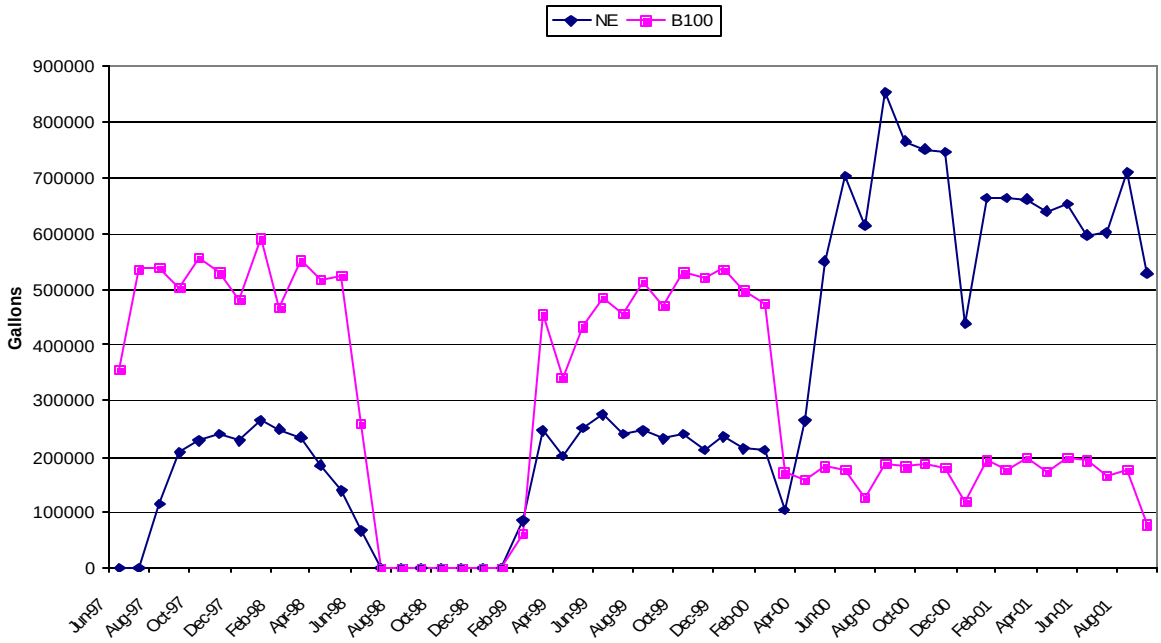

Chart 1. Historical Northeast Site and Building 100 Groundwater Recovery

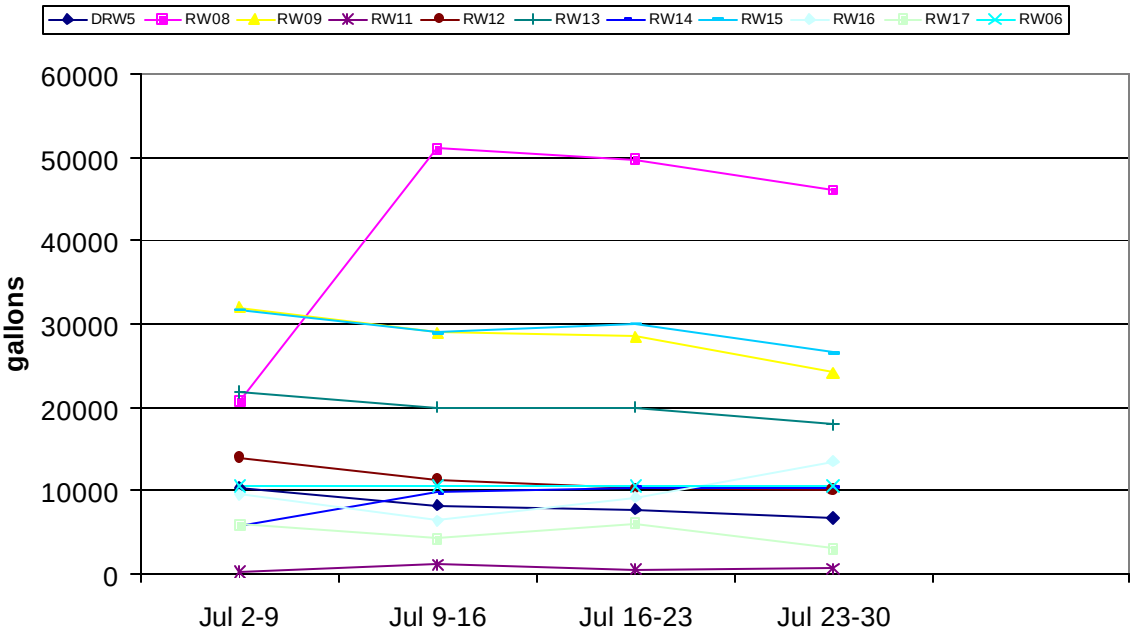

Chart 2. July 2001 Northeast Site (Individual Wells) Groundwater Recovery

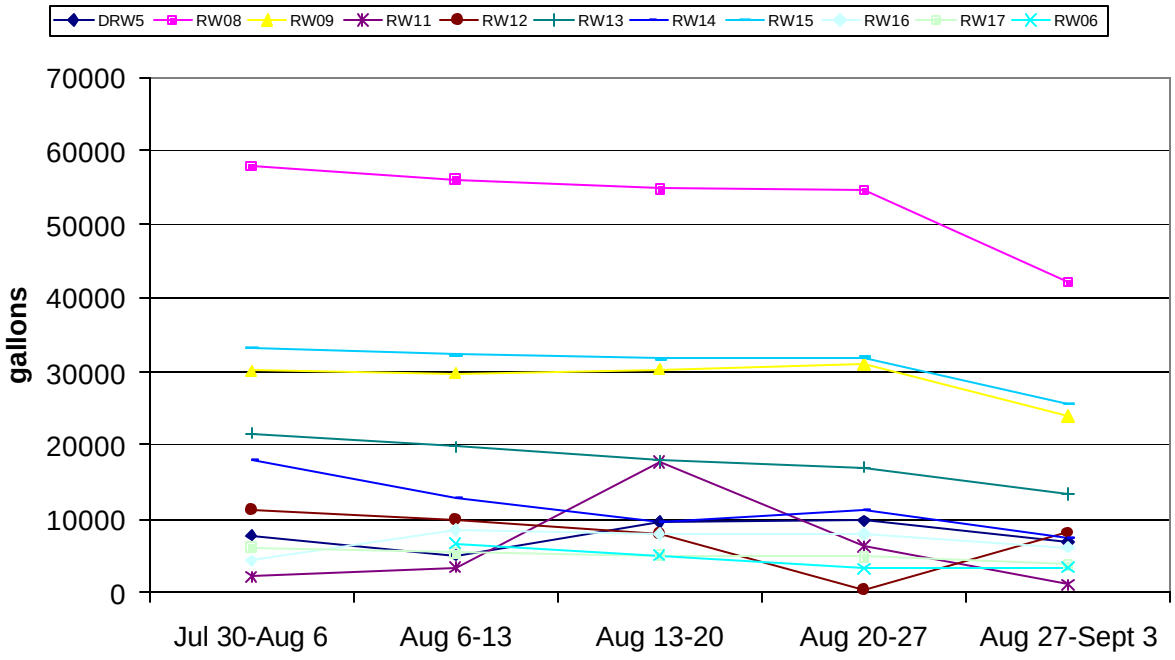

Chart 3. August 2001 Northeast Site (Individual Wells) Groundwater Recovery

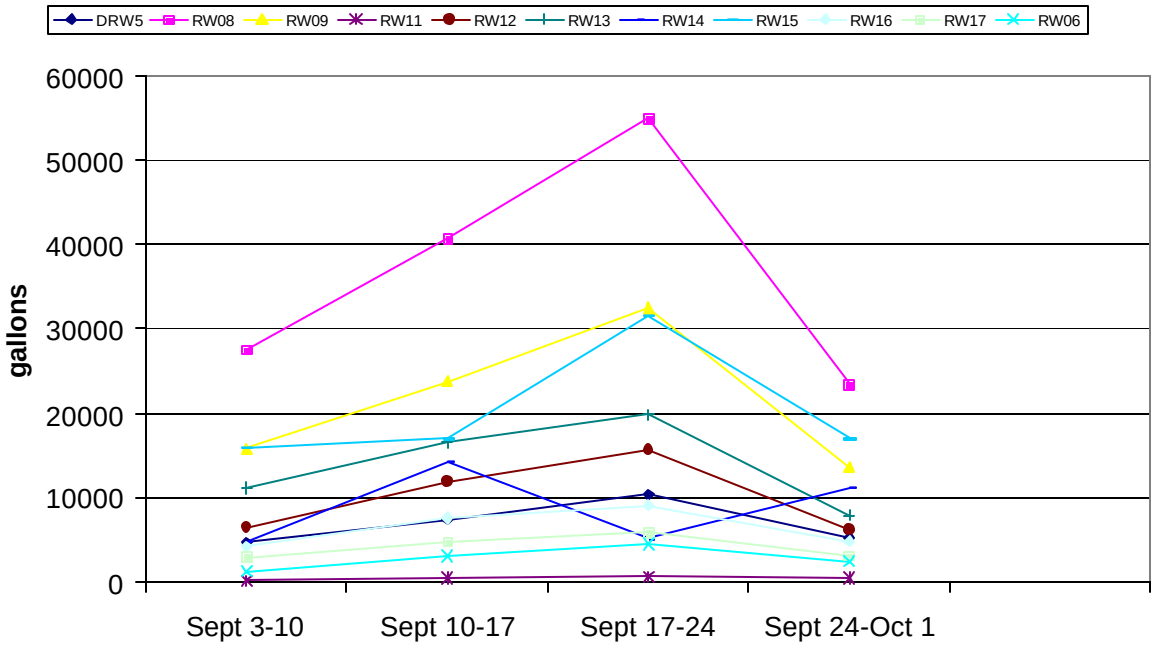

Chart 4. September 2001 Northeast Site (Individual Wells) Groundwater Recovery

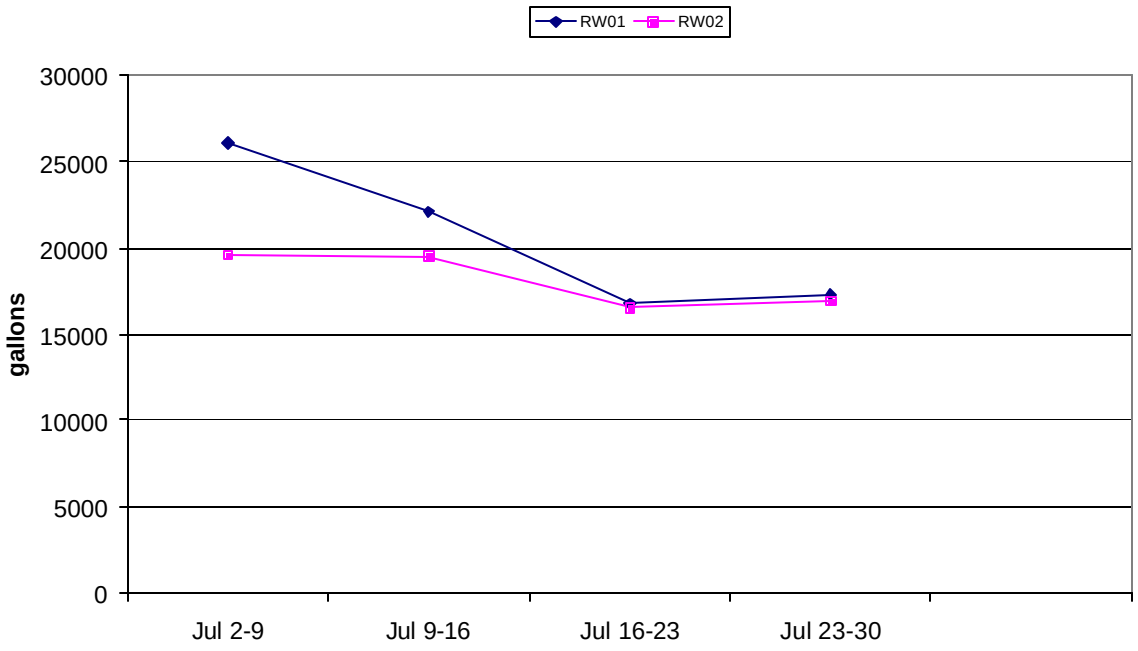

Chart 5. July 2001 Building 100 Groundwater Recovery

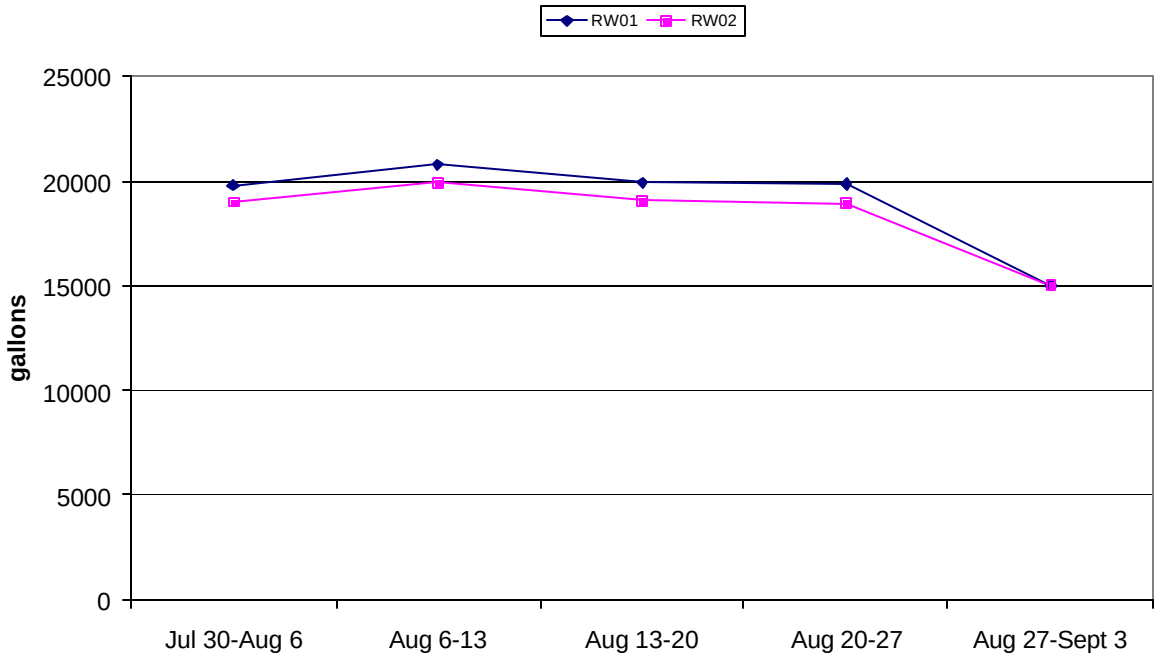

Chart 6. August 2001 Building 100 Groundwater Recovery

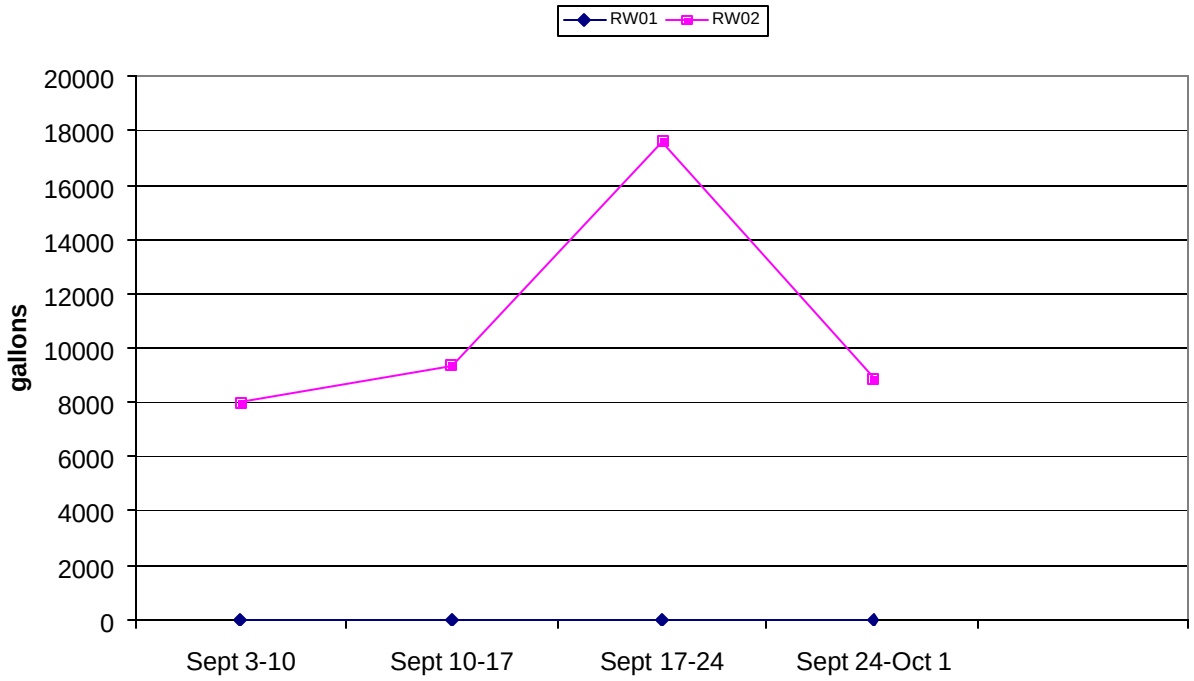

Chart 7. September 2001 Building 100 Groundwater Recovery

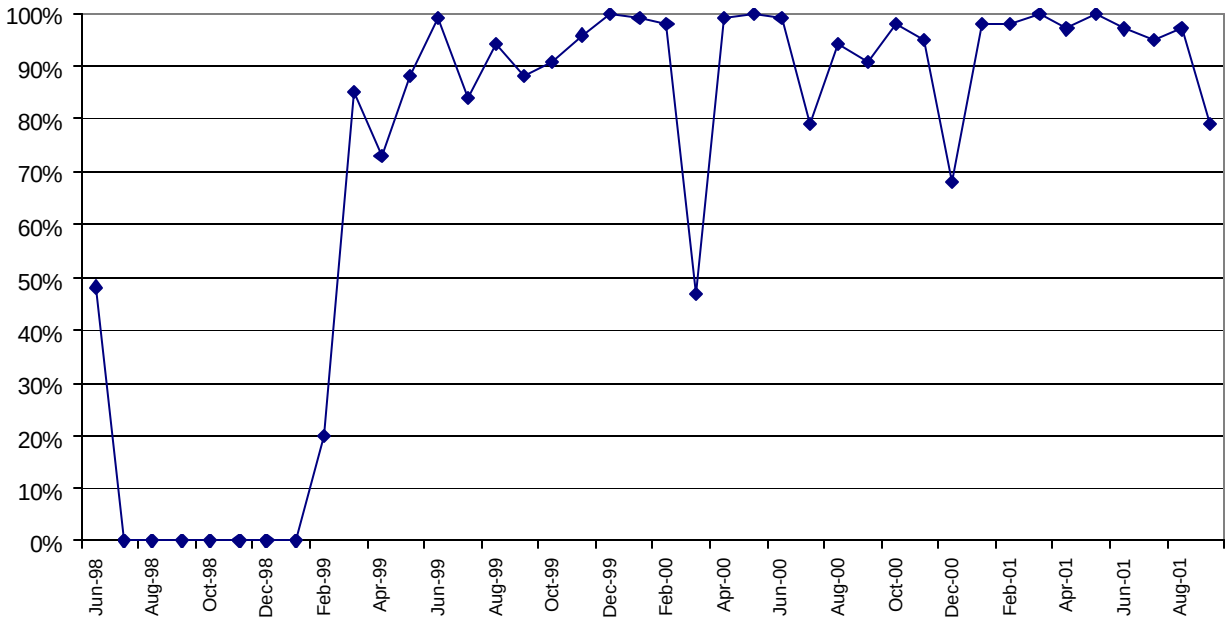

Chart 8. Historical Northeast Site Air Stripper—Percent Time On-Line

Appendix A

Laboratory Reports—July 2001 Quarterly Results

Table A–1. Relative Percent Difference (RPD) for Duplicate Samples

Sample ID	Duplicate ID	Case Number	Constituent	S[a]	D[b]	RPD Value	5 times DL[c]	Fail[d]
PIN12–RW02	PIN12–0589	B152293	1,1-Dichloroethene	9.8	4.8	68.5	125	
		B152293	cis-1,2-Dichloroethene	790	680	15.0	125	
		B152293	Methylene chloride	79	60	27.3	600	
		B152293	Propane, 2-methoxy-2-methyl-	110	120	8.7	1,250	
		B152293	trans-1,2-Dichloroethene	74	62	17.6	125	
		B152293	Trichloroethene	1200	1100	8.7	125	
PIN15–0530	PIN15–0580	B152233	Methylene chloride	2.5	0.6	122.6	25	
PIN15–DRW5	PIN15–0583	B152293	Benzene	14	16	13.3	500	
		B152293	cis-1,2-Dichloroethene	4500	5000	10.5	500	
		B152293	m,p-Xylene	50	37	29.9	500	
		B152293	Methylene chloride	200	52	117.5	2,500	
		B152293	Toluene	2300	2600	12.2	500	
		B152293	Trichloroethene	1800	1900	5.4	500	
		B152293	Vinyl chloride	570	340	50.5	500	F
PIN15–M03D	PIN15–0582	B152294	Benzene	0.31	0.34	9.2	5	
		B152294	m,p-Xylene	1.8	2	10.5	5	
		B152294	Methylene chloride	0.55	1.7	102.2	25	
		B152294	o-Xylene	1.2	1.3	8.0	5	
		B152294	Trichloroethene	0.5	0.21	81.7	5	
		B152294	Vinyl chloride	4.9	3.8	25.3	5	
PIN15–RW13	PIN15–0581	B152279	Benzene	23	24	4.3	250	
		B152279	cis-1,2-Dichloroethene	170	170	0.0	250	
		B152279	Methylene chloride	2800	2600	7.4	1,250	
		B152279	o-Xylene	25	6.2	120.5	250	
		B152279	Propane, 2-methoxy-2-methyl-	250	65	117.5	2,500	
		B152279	Toluene	260	260	0.0	250	
		B152279	Vinyl chloride	170	25	148.7	250	
PIN18–0525	PIN18–0650	B152279	Arsenic	0.036	0.033	8.7	0.05	
PIN12–RW02	PIN12–0589	B152293	1,1-Dichloroethene	9.8	4.8	68.5	125	

[a]S = Original sample (N001), VOC concentration in mg/L.
[b]D = Duplicate sample (N002), VOC concentration in mg/L.
[c]DL = Detected limit.
[d]Fail is an RPD greater than " 30% and more than 5 times the detection limit. F=fail.

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Appendix B

Laboratory Reports for
Northeast Site Treatment System—July to September 2001

Appendix C

Laboratory Reports for WWNA—July to September 2001

Appendix D

Northeast Site Treatment System Historical Data Table

Table D–1. Historical Summary of Groundwater Recovery at the Northeast Site and Building 100

Report Date	Quarterly (gallons)	Total To Date (gallons)
April–June 1997	356,886	356,886
July–September 1997	1,899,871	2,256,757
October–December 1997	2,265,460	4,522,217
January–March 1998	2,358,081	6,880,298
April–June 1998	1,693,697	8,573,995
July–September 1998	0	8,573,995
October–December 1998	0	8,573,995
January–March 1999	848,912	9,422,907
April–June 1999	1,985,705	11,408,612
July–September 1999	2,158,568	13,567,270
October–December 1999	2,285,471	15,852,741
January–March 2000	1,670,059	17,522,801
April–June 2000	2,031,821	19,554,622
July–September 2000	2,728,441	22,283,063
October–December 2000	2,416,705	24,699,768
January–March 2001	2,977,868	27,677,636
April–June 2001	2,452,063	30,129,699
July–September 2001	2,262,233	32,391,932

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